

## Adaptation

李有利, 杨景春, 1997, 河西走廊平原区全新世河流阶地对气候变化的响应, 中国沙漠, 17(3): 248-252

对河西走廊盆地内河流阶地的发育情况与古气候变化情况进行分析, 发现河流下切和加积过程与气候变化之间有密切关系。下切作用发生在气候稳定湿润期, 加积作用发生在气候明显转化期。第一级阶地形成于5.57-3.15ka

BP, 处于气候由暖湿向干冷转变时期, 并且气候波动剧烈。第二级阶地形成于11-8ka BP,

位于气候由干冷向暖湿转变时期, 气候波动也比较剧烈。在气候稳定湿润的8-6ka

BP, 河西走廊的河流普遍发生下切。

关键词: 河流阶地 气候变化  
河西走廊

Li Youli and Yang Jingchun. 1997. Response of alluvial terraces to Holocene climatic changes in the Hexi Corridor Basin, Gansu, China. Journal of Desert Research 17(3):248-252.

The relationship between alluvial terraces and the climatic changes in the Holocene is discussed. It is found that the downcutting period was coincident with a stable warmer and wetter climate, and that aggradation took place when the climate was changing either from drier to wetter or from wetter to drier. The lower terraces were formed between 5.57 ka BP and 3.15 ka BP, when climate was changing from wetter to drier. The higher terraces were formed between 11 ka BP and 8 ka BP when the climate was changing from drier to wetter. There was a downcutting period of the rivers from 8 ka BP to 6 ka BP.

Keywords: alluvial terraces, climatic change, Hexi Corridor Basin



王志禄, 祁治林, 1997, 北亚热带边缘引种油橄榄气候适应性及开发价值的研究, 中国农业气象, 18(6): 38-40

根据实验研究, 分析了油橄榄在甘肃武都白龙江河谷地带引种的气候适应性程度,

评价了其开发价值及其开发前景。

关键词: 油橄榄 气候生态 开发利用

Wang Zhilu and Qi Zhilin. 1997. Studies on the adaptability of climate for growing olive trees and the onset of spring in the marginal area of north subtropics. Agricultural Meteorology 18(6):38-40.

This paper presents the experimental research used to analyze the degree of the adaptability of climate for growing olive trees in the Bailong River Valley of Wu Du, Gansu Province, and also examined the use and exploitation of changes in climate.

Keywords: olive tree, climatic ecology, exploitation and utilization

吴景云, 杜志贵,

华云峰, 1997, 浙中地区菜豌豆翻秋栽培的气候适宜性, 中国农业气象, 18(1): 30-33

通过菜豌豆翻秋栽培试验, 分析出秋播期气候对豌豆生长的相宜性与相悖性, 并发现如采用相应的农艺措施, 趋利弊害, 豌豆翻秋是可行的。并且证实菜豌豆翻秋栽培具有生产周期短, 工本投资少, 经济效益高的优势。

关键词: 菜豌豆 翻秋栽培 气候适宜性

Wu Jingyun, Du Zhigui, and Hua Yunfeng. 1997. Climatic sustainability for autumn-grown vegetable peas in Central Zhengjiang Province. *Agricultural Meteorology* 18(1):30-33.

Based on field experiments on the cultivation of peas for off-season consumption, the adaptation and the conventions were found. Results showed that it is feasible to grow peas in autumn if appropriate cultural practices are used, leading to a shorter production cycle, less labor input, and higher economic return.

Keywords: *Pisum sativum* var. *hortense* Poir, autumn cultivation, climatic suitability



姜逢清, 马虹, 胡汝骥,

袁玉江, 1997, 新疆地表水资源对亚洲中部未来气候变化的响应, 干旱区地理, 20(4): 40-46

采用经验正交函数展开了分析新疆北部地表水资源的时空分布特征, 并将实测资料与历史资料相结合, 对南疆地表水资源进行分析。结果表明: 新疆地表水资源的未来变化趋势受亚洲中部未来气候变化的影响, 亚洲中部气候变冷的效应对新疆来说总体上是有利的。

关键词: 新疆 地表水资源 亚洲中部 气候变化

Jiang Fengqing, Ma Hong, Hu Ruji, and Yuan Yujiang. 1997. Response of water resources in Xinjiang to future climate changes in Central Asia. *Arid Land Geography* 20(4):40-46.

The spatial and temporal distribution of surface water resources in north Xinjiang are analyzed using an empirical orthogonal function expansion. Based on research done previously, the sequence of surface water resources in north Xinjiang is extended from 250 to 412 years, by combining two different sequences of tree-ring chronologies into one sequence. The water resources in the south Xinjiang are analyzed using historical data with the regional characteristics of water resource circulation taken into account. The results show that the cooling trend of the climate in Central Asia will produce some good effects on water resources in Xinjiang.

Keywords: Xinjiang, surface water resources, Central Asia, climate change

朱诚, 于世永,

卢春成, 1997, 长江三峡及江汉平原地区全新世环境考古与异常洪涝灾害研究, 地理学报,

52(3): 268-278

根据对长江三峡及江汉平原地区新石器文化遗址的分布、文化层、自然地层和埋藏古树的研究, 并结合历史资料分析, 探讨了本区全新世异常洪水频率的变化, 共划分出4个洪水频发期: 第I个洪水期 (8000 a BP-5500 a

BP), 共发生特大洪水9次; 第II洪水期 (4700 a BP-3500 a

BP), 至少发生特大洪水9次; 第III洪水期 (2200 a BP-700 a BP),

共发生特大洪水91次; 第IV洪水期 (500 a BP-100 a

BP), 共发生特大洪水52次, 其中在小冰期最冷期 (300 a BP-100 a

BP) 就有40次。前3个洪水期均与高温、高海面期强盛的夏季风活动有关, 其中第III洪水期还与江汉平原地区围

、筑堤等不合理的土地利用有关, 第IV洪水期与强盛的冬季风活动和环太平洋表层海温异常事件有关。

关键词: 长江三峡 江汉平原

全新世 环境考古 异常洪涝灾害

Zhu Cheng, Yu Shiyong, and Lu Chuncheng.

1997. The study on Holocene environmental archaeology and extreme flood disaster in the Three Gorges of the ChangJiang River and the JiangHan Plain. Acta Geographica Sinica 52(3):268-278.

Based on a cultural site of Neolithic age, cultural layers, natural layers, fossil trees, and material history in the Three Gorges Changjiang River and the Jianghan Plain, the frequency (times per 100 years) changes of large floods in this region could be clustered into 4 distinct time intervals: (1) Deluge I from 8 ka BP to 5.5 ka BP, had 9 times of extreme floods; (2) Deluge II, from 4.7 ka BP to 3.5 ka BP, had 9 times of extreme floods at least; (3) Deluge III, from 2.2 ka BP to 0.7 ka BP, had 91 times of extreme floods; and (4) Deluge IV, from 0.5 ka BP to 0.1 a BP, had 52 times of extreme floods totally. In the coldest phase of the Little Ice Age (0.3 ka BP to 0.1 ka BP), floods took place 40 times. The first three deluges are all correlated with powerful activity of the East Asia monsoon during periods of high temperature and high sea level. In addition, Deluge III also resulted from unreasonable land use, such as dike-building and reclaiming land from marshes etc. in the Jianghan Plain. Deluge IV is related to the powerful activity of the winter monsoon and the anomalous sea surface temperature (SST) of the equator east of Pacific Ocean.

Keywords: the Three Gorges of Changjiang River, Jianghan Plain, extreme flood disasters, environmental archaeology, Holocene period

薛滨, 王苏民, 夏威夷等, 1997,  
若尔盖RM孔揭示的青藏高原900 ka  
BP 以来的隆升与环境变化,  
中国科学, 27(6): 543-547

通过对青藏高原迄今为止最深的全  
取芯井,  
即若尔盖盆地RM孔湖泊沉积物环境  
多代用指标的综合判识, 重建了900  
ka BP

以来盆地的古气候古环境演化序列  
。根据该孔的沉积特征、沉积旋回  
的结构, 以及沉积速率的变化, 结  
合环境冷暖、干湿的组合特点, 分  
辨出900 ka BP

以来高原东部3次明显的隆升加速时  
期, 也即800, 300及160 ka BP。

同时对青藏高原3次构造加速抬升在  
全球变化背景下的环境效应作了初  
步探讨。

关键词: 若尔盖盆地 900 ka BP  
隆升过程 环境演化

Xue Bin, Wang Sumin, Xia Weilan et al.  
1997. The uplifting and environmental change  
of Qinghai-Xizang (Tibetan) Plateau in the past  
0.9 Ma inferred from core RM of Zoige Basin.  
Science in China (Series D) 27(6):543-547.

According to a multidisciplinary study on the  
lake sediments from core RM of the Zoige  
Basin (i.e., the deepest wholly collected core in  
Tibetan Plateau), the paleoclimate and  
paleoenvironment for the basin in the past 0.9  
Ma are reconstructed. The analytical results  
suggest that there were 3 distinct accelerated  
uplifting periods for the east Plateau in the past  
0.9 Ma (i.e., 800, 300, and 160 ka BP).  
Sedimentary characteristics, the texture of  
sedimentary cycles, and variations of  
depositional rates, in conjunction with the  
environmental features of cold/warm to dry/wet  
combinations, are presented. The paper also  
probes into the environmental effects under the  
three accelerated tectonic upliftings on the  
background of global change.

Keywords: Zoige Basin, 0.9 Ma BP, uplifting  
process, environmental change



刘禹, 吴祥定, 邵雪梅等, 1997,  
树轮密度、稳定C同位素对过去近  
100a陕西黄陵季节气温与降水的恢  
复, 中国科学, 27(30): 271-276

通过相关函数分析,  
表明黄陵地区树轮早林最小密度与6  
月份气温及4~6月份降水显著相关,  
相关系数分别为0.616 和-  
0.662。在此基础上, 将早林最小密度  
指标与稳定C同位素指标采用第一主  
分量法合并, 较精确地重建了黄陵地  
区6月气温, 重建值的解释方差  
达45%。同时以早林最小密度重建  
了该区4~6月降水,  
解释方差达49%。6月份气温实质

Liu Yu, Wu Xiangding, Shao Xuemei et al.  
1997. The restoration of seasonal temperature  
and precipitation using annual ring density and  
stable carbon isotope in Huangling of Shaanxi  
Province in the past 100 years. Science in China  
27(30):271-276.

Relative function analysis indicates that there is  
significant correlation between the minimum  
tree-ring density of early woods and the  
temperature of June and precipitation from  
April to June. The correlation coefficients were  
0.616 and -0.662, respectively. Based on these,  
the index of minimum density of early woods  
coincided with the index of stable C isotope  
using the first principle factor analysis, the  
temperature of June was reconstructed precisely,  
with an interpretive variance of 45%. At the same  
time, the precipitation from April to June was also  
reconstructed based on the minimum density of  
early woods and its interpretive variance was



上指示了东亚夏季风前锋到达此地时间上的早晚。

关键词: 陕西黄陵 树轮密度  
稳定C同位素 气温 降水  
东亚夏季风

49%. The temperature of June actually indicated the early and late coming of the front of East Asian monsoon.

Keywords: Huangling Shaanxi Province, tree-ring density, stable C isotope, temperature, precipitation, East Asian monsoon



陈骏, 季峻峰等, 1997,  
陕西洛川黄土中 $Mn^{2+}$   
电子顺磁共振特征与古季风变迁,  
科学通报, 42(22): 2419-2421

通过分析陕西洛川黄土和古土壤中  
 $Mn^{2+}$  电子顺磁共振谱,  
发现黄土中的EPR (电子顺磁共振  
) 信号是一种对东亚夏季风响应比  
较敏感的气候代用指标。

关键词: 古季风 黄土 古土壤  
 $Mn^{2+}$ 的EPR谱

Chen Jun, Ji Junfeng et al. 1997. Electron paramagnetic resonance studies of  $Mn^{2+}$  in the Loess Plateau of Central China: Implication for variation of East Asia summer monsoon. Chinese Science Bulletin 42(22):2419-2421.

The  $Mn^{2+}$  electron paramagnetic resonance (EPR) intensity recorded in the Chinese loess-paleosol sequence shows a close correlation with magnetic susceptibility and strontium content as well as the oscillation of the paleoclimate. Thus the  $Mn^{2+}$  EPR signal can serve as an indicator of the East Asia summer monsoon intensity fluctuations.

Keywords: paleomonsoon, loess, paleosol, EPR signal of  $Mn^{2+}$



汪永进, 陈琪, 刘泽纯等, 1997,  
南京汤山溶洞石笋连续200ka古气候  
记录, 科学通报,  
42(19): 2093-2097

对南京东郊汤山喀斯特溶洞内的一  
支石笋进行了年代学、同位素地球  
化学和岩相学研究,  
获得了距今381~166ka高分辨率古  
气候演变信息。

关键词: 稳定同位素、气候变化、  
石笋、南京

Wang Yongjin, Chen Qi, Liu Zechun et al. 1997. A continuous 200-Ka paleoclimatic record from stalagmite in Tangshan Cave, Nanjing. Chinese Science Bulletin 42(19):2093-2097.

An oxygen isotope temperature record from 381 to 166 ka BP has been obtained by combining data on the isotopic composition of calcites with that of fluid inclusions trapped in a stalagmite from a limestone cave in which a fossil cranium was deposited. Several laminae in the microsequence of the stalagmite represent climatic events or shifts.

Keywords: stable isotope, climatic change, stalagmite, Nanjing

盛文坤, 姚檀栋,

邓友生, 1997, 用冰芯中的硫酸根离子探讨古里雅冰川作用区的干湿变化, 冰川冻土, 19(1): 90-94

根据古里雅冰帽中的 $\text{SO}_4^{2-}$

离子主要来源于陆地地表矿物以及干旱少雨的内陆地区可溶性硫酸盐分布广泛的事实, 在地表矿物中含量的变化主要受气候条件, 特别是干湿程度所控制的自然现象, 提出了用古里雅冰芯中的 $\text{SO}_4^{2-}$ 离子推断该冰川作用区的干湿变化。

关键词: 古里雅冰帽  $\text{SO}_4^{2-}$  干湿变化

刘光秀, 施雅风,

沈永平, 1997, 青藏高原全新世大暖期环境特征之初步研究, 冰川冻土, 19(2): 114-123

发生在9.0-3.5 ka BP

的高原全新世大暖期, 早于我国大陆其它地区, 并且在高原内部存在区域差异, 东北部、西部及南部地区较早, 其它地区稍晚。大暖期时, 高原植被景观表现在分布高度的上移及森林的扩大。在大暖期鼎盛期, 高原年均温度高于现代 $3-5^{\circ}\text{C}$ 左右, 夏季风增强, 年降水量增加100-400 mm。

湖泊水面扩张并升高, 湖水变淡, 高地泥炭发育, 冰川退缩, 多年冻土退化。

关键词: 青藏高原 全新世大暖期 环境特征

Sheng Wenkun, Yao Tandong, and Deng Yousheng. 1997. Dryness variation in the Guliya Ice Cap Region inferred from  $\text{SO}_4^{2-}$  within ice core. Journal of Glaciology and Geocryology 19(1):90-94.

The dryness variation in the glaciated region is inferred from the  $\text{SO}_4^{2-}$  within the Guliya ice core, based on the facts that  $\text{SO}_4^{2-}$  in the core mainly originates from terrestrial surface minerals, soluble sulfate is widespread in the dry inland regions, and the changes in concentrations of surface minerals are governed by climate conditions, particularly dryness. The dryness variation since the Little Ice Age can be inferred in accordance with the  $\text{SO}_4^{2-}$  within the Guliya ice core.

Keywords: Guliya Ice Cap,  $\text{SO}_4^{2-}$ , dryness variation



Liu Guangxiu, Shi Yafeng, and Shen Yongping. 1997. Holocene megathermal environment in the Tibetan Plateau. Journal of Glaciology and Geocryology 19(2):114-123.

The Holocene megathermal event took place about 9.0-3.5 ka BP in the Tibetan Plateau, earlier than in other places in China. The starting and ending dates of the megathermal had regional differences inland of the plateau, in general, early in northeastern, western, and southern parts and late in the other parts. During the megathermal, vegetation on the plateau was very different from vegetation at the present time. The altitude zonation of vegetation moved forward and that of forests extended. In the maximum megathermal stage, the mean annual air temperature was  $3$  to  $5^{\circ}\text{C}$  higher than that of the present, annual precipitation increased by 100-400 mm with strengthened summer monsoon, and lakes extended and their level rose with freshened water in them. In addition, highland peat formed, glaciers retreated, and permafrost degraded during the Holocene Megathermal in the plateau.

Keywords: Tibetan Plateau, Holocene Megathermal, environment features

姚檀栋, L. G. Thompson,

施雅风等, 1997, 古里雅冰芯中末次间冰期以来气候变化记录研究, 中国科学, 27(5): 447-452

通过对古里雅309 m冰芯上部268 m的研究, 重建了末次间冰期以来的气候环境变化。根据对古里雅冰芯的研究, 清楚地划分出阶段1(冰后期)、2(末次冰期冰盛期)、3(末次冰期间冰阶)、4(末次冰期早冰阶)和5(末次间冰期)。阶段5又可分出 a, b, c, d, e 5

个亚阶段。古里雅冰芯  $\delta^{18}\text{O}$  记录明确地显示了青藏高原温度变化和太阳辐射的密切关系。研究表明, 太阳辐射是驱动青藏高原气候变化的主要因子。古里雅冰芯记录与北极格陵兰冰芯和南极Vostok冰芯的对比研究表明, 青藏高原地区气候变化幅度大于北极地区和南极地区。  
关键词: 古里雅冰芯 末次间冰期 气候变化 三极对比

Yao Tandong, L. G. Thompson, and Shi Yafeng et al. 1997. Climate variation since the last interglaciation recorded in the Guliya Ice Core. Science in China (Series D) 27(5):447-452.

The climatic and environmental variations since the Last Interglaciation are reconstructed based on a study of the upper 268 m of the 309-m-long Guliya ice core. Five stages can be distinguished since the Last Interglaciation from the  $\delta^{18}\text{O}$  record in the Guliya ice core: Stage 1 (Deglaciation), Stage 2 (the Last Glacial Maximum), Stage 3 (interstadial), Stage 4 (interstadial in the early glacial maximum), and Stage 5 (the Last Interglaciation). Stage 5 can be divided further into 5 substages. The  $\delta^{18}\text{O}$  record in the Guliya ice core indicates clearly the close correlation between temperature variation on the Tibetan Plateau and solar activities. The study indicates that solar activity is a main forcing factor on the climate on the Tibetan Plateau. Through a comparison of the ice record in Guliya with that in Greenland and the Antarctic, it can be found that the variation amplitude of temperature is different.

Keywords: climate variation, Last Interglaciation, Guliya ice core, comparison of three poles



周卫建, 安芷生, S. C. Porter

等, 1997, 末次冰消期东亚和挪威海气候事件的对比, 中国科学, 27(3): 260-264

通过黄土—古土壤和泥炭剖面的高分辨率 $^{14}\text{C}$ 年代学以及有机质的 $\delta^{13}\text{C}$

值和有机碳百分含量的研究, 揭示了末次冰消期百年尺度温暖—寒冷的东亚季风气候颤动事件及其反映的有意义的降水变率。它们由波令(Bolling 13-12.5 ka BP), 老仙女木(Older Dryas 12.5-11.75 ka BP), 阿勒鲁德(Allerod 11.75-11.2

Zhou Weijian, An Zhisheng, S. C. Porter et al. 1997. Correlation of climatic events between East Asia and Norwegian Sea during Last Deglaciation. Science in China (Series D) 27(3):260-264.

Using a high-resolution  $^{14}\text{C}$  chronology,  $\delta^{13}\text{C}$  values, and organic content from loess/paleosol and peat profiles in China, we can demonstrate century-scale warm-cold East Asia monsoon palaeoclimatic fluctuation events and significant precipitation variability within the Last Deglaciation. The major climatic events recognized are the Bolling (13-12.5 ka BP), Older Dryas (12.5-11.750 ka BP), Allerod (11.75-11.2 ka BP), and Younger Dryas (11.2-10 ka BP). The stratigraphic structure of the last deglaciation sediments is characterized by frequent changes in sedimentation phases

ka BP) 和新仙女木 (Younger Dryas 11.2-10 ka BP.) 事件构成。

其地层结构表现出多种沉积相的变化, 反映了气候的不稳定性。这些高频、快速的气候事件可与挪威海海面温度记录的气候事件——对比。反映了东亚季风气候通过西风带及其相关的气压系统与极地、高纬度地区古气候的遥相关。

关键词: 末次冰消期

东亚季风气候的不稳定性

黄土—古土壤 古气候遥相关

reflecting climatic instability. These high-frequency, rapid climatic events can be correlated with fluctuations recorded by sea surface temperature in the Norwegian Sea. This indicates a palaeoclimate teleconnection between polar, high-latitude areas and East Asian monsoon areas through westerlies and the related atmospheric pressure system.

Keywords: Last Deglaciation, East Asian monsoon climatic instability, palaeoclimatic teleconnection, loess-paleosol



吴敬禄, 王苏民, 潘红玺,

夏威夷, 1997, 青藏高原东部RM孔 140 ka

以来湖泊碳酸盐同位素记录的古气候特征, 中国科学, 27(3): 255-259

Wu Jinglu, Wang Sumin, Pan Hongxi, and Xia Weilan. 1997. Climatic variations in the past 140 ka recorded in core RM, East Qinghai-Xizang Plateau. Science in China (Series D) 27(3):255-259.

通过若尔盖盆地RM孔湖泊化学沉积碳酸盐氧、碳同位素代用指标, 重建了该区近140 ka

以来的古气候演化历史, 其中末次冰期至少存在有7次暖波动及5次冷事件, 其波动特征可与冰芯及深海记录相比较; 而末次间冰期内部的次级波动与格陵兰冰芯GRIP氧同位素记录相一致, 早期的Eemian暖期也存在两次冷波动。演化结果表明了末次间冰期和冰期气候的不稳定性。色素和碳酸盐含量指标也具有与氧同位素记录相似的结果。

关键词: 若尔盖盆地 氧同位素 气候波动

The sequences of climatic evolution are reconstructed by the analyses of  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  of carbonate from core RM in the Zoige Basin since 140 ka BP. During the Last Glaciation at least seven warm climatic fluctuations and five cold events correlated with the ice core and deep sea records and during the preceding last interglacial period there were two cold climatic variations coinciding with the record of ice core of the Greenland Ice Core Project (GRIP). These results depict climatic instability in east Qinghai-Xizang Plateau over the last interglacial period. In addition, the environmental proxies of the carbonate content and pigments indicate similar results for the stable isotope record from core RM.

Keywords: Zoige Basin, oxygen isotope, climatic fluctuation

陆龙骅, 卞林根,

贾朋群, 1997, 南极和邻近地区温度的时空变化特征, 中国科学, 27(3): 284-288

对南极和邻近地区1957-1993

年气温的空间分布特征、时间变化趋势及多年振荡特征的研究表明, 南极地区的短期气候变化在时间、空间上都是多样的, 南极不是对全球温室效应响应最强烈的地区, 其温度变化趋势与全球平均变化有较大差异。这种变化和差异很难简单地用全球温室效应来解释。

关键词: 南极 温度 温室效应  
变化趋势 振荡特征

罗育建,

陈镇东, 1997, 台湾高山湖泊沉积记录指示的近4000年气候与环境变化, 中国科学, 27(4): 366-372

海拔3310 m

嘉明湖的沉积物, 记录了台湾高山近4ka来的古气候变动, 即2.2ka BP之前的温暖期, 相当于全新世大暖期的后半段, 以及2.2ka BP以来的降温期; 在大暖期结束前, 出现了一段特别温暖的时期(2.2-2.4ka BP)。鸳鸯湖及七彩湖的沉积物, 也显示大暖期似乎结束于2-2.3ka BP。另外, 在降温期中出现了一短暂暖期(820-1320AD), 似乎对应于中世纪暖期; 而自1320 AD开始, 气候又转变为干冷, 意味着小冰期来临。这些气候变动也可与大鬼湖所记录的相对应。

关键词: 古气候 小冰期  
中世纪大暖期 全新世大暖期 台湾  
嘉明湖 鸳鸯湖 七彩湖

Lu Longhua, Bian Linggen, and Jia Pengqun. 1997. The temporal and spatial characteristics of the surface air temperature variation over the Antarctic and its surrounding area. Science in China (Series D) 27(3):284-288.

The characteristics of the spatial distribution, temporal variations trend, and oscillation for the surface air temperature variations during 1957-1993 in the Antarctic and its surrounding area were analyzed. The results show that the short-time climate change in the Antarctic is complex both temporally and spatially. The Antarctic is by no means the strongest responding region to the global greenhouse effect. There is a distinct difference in the trends of the temperature changes for the Antarctic and the global mean that cannot be explained simply by the global greenhouse effect.

Keywords: the Antarctic, temperature, greenhouse effect, variation trend, oscillation features



Luo Jiann-Yuh and Chen Tung Arthur. 1997. Paleoclimatological and paleoenvironmental records since 4000 a BP in sediments of alpine lakes in Taiwan. Science in China. (Series D) 27(4):366-372.

The 3310-m-high Chia-min Lake records the climatic history since 4 ka BP in Taiwan. The warm/wet period before 2.2 ka BP seemed to correspond to the later part of the Holocene Megathermal, and the cold/dry period during 0-2.2 ka BP correspond to the Katathermal. Before the termination of the Megathermal, an especially warm and humid segment (2.2-2.4 ka BP) emerged. The palaeoclimatic records from Yuen-yang and Chi-tsai Lakes support the notion that the Megathermal in Taiwan terminated during 2-2.3 ka BP. A warm segment (820-1320 AD) in the Katathermal could be considered the Medieval Warm Period. The climate turned cold and dry after 1320 AD and this indicated the onset of the Little Ice Age. These palaeoclimatic variations are also in good agreement with those recorded in Great Ghost Lake.

Keywords: palaeoclimate, Little Ice Age, Medieval Warm Period, Holocene, Megathermal, Taiwan, Chia-min Lake, Yuen-yang Lake, Chi-tsai Lake

董光荣, 靳鹤龄,

陈惠忠, 1997, 末次间冰期以来沙漠—黄土边界带移动与气候变化, 第四纪研究, (2): 158-167

位于现代季风区边缘的沙漠—黄土边界带在末次间冰期以来经历了多次北进南退移动和暖湿、冷干变化。其中, 盛冰期时移动幅度最大, 南界可能达30°N左右; 末次冰期和全新世气候鼎盛期最靠西北, 南界在古长城以北。全球冰期—间冰期波动导致的气候变化以及东亚冬夏季风强弱变化是控制边界移动和气候变化的根本因素。

关键词: 末次间冰期

沙漠—黄土边界带 气候变化

Dong Guangrong, Jin Heling, and Chen Huizhong. 1997. Desert-loess boundary belt shift and climatic change since the Last Interglacial Period. Quaternary Sciences (2):158-167.

Desert-loess boundary belt, which is located in the fringe of the contemporary monsoon climate region, has undergone a multiple northward-shift, southward-retreat, and the change of warm and cold, wet and dry since the Last Interglacial Period. During the Last Interglacial stage, its southern border reached about 30° N, and during the Last Glacial Period, the northern border was close to the 400 mm isohyet of today, its middle part being at the zone of the ancient Great Wall ruins. The shift of the desert-loess boundary belt is an inevitable outcome of global glacial-interglacial climatic variation and is related to the variations of the East-Asia monsoon.

Keywords: Last Interglacial period, desert-loess boundary belt, climatic change



曾永年, 马海洲,

李玲琴等, 1997, 1.2 Ma BP以来西宁盆地沙漠化问题初探, 中国沙漠, 17(3): 226-229

西宁盆地大墩岭黄土剖面L<sub>1</sub>、L<sub>2</sub>、L<sub>15</sub>中存在3层古风成砂。沉积年代及各种环境记录的分析表明, 这3层古风成砂分别代表了1.2 Ma BP以来西宁盆地在中更新世初、中更新世末和晚更新世晚期发生的3次较大规模的流沙活动, 均受制于冰期时干冷严酷的气候条件控制。进一步分析得出西宁盆地的沙漠化正逆过程受到第四纪全球波动变化以及青藏高原隆升的影响。第四纪青藏高原冰川的冰缘作用为其边缘的沙漠、黄土沉积提供了丰富的物质来源。

关键词: 西宁盆地 古风成砂 气候变化

Zeng Yongnian, Ma Haizhou, Li Lingqin et al. 1997. First discussion on problems of desertification in the Xining Basin since 1.2 Ma BP. Journal of Desert Research 17(3):226-229.

There are three eolian paleosand layers in the loess profile of Dadunling, Xining Basin. The age and environmental records of loess stratigraphy proved that these three eolian paleosand layers, which represent three extensive desert expansion periods in the Xining Basin since 1.2 Ma BP, were formed in the early part and the latter part of the Middle Pleistocene and the latter part of the Last Pleistocene, respectively. Furthermore, the Quaternary climatic changes and the uplift of Qinghai-Xizang Plateau controlled the advance and the retreat processes of desertification in the studied area. In detail, the periglacial action of the plateau glacier in the Quaternary produced a lot of detritus for desert and loess deposition in adjacent areas.

Keywords: Xining Basin, Eolian paleosand, climatic changes

张虎才, 1997, 撒哈拉沙漠东北部  
全新世气候与人类活动,  
中国沙漠, 17(3): 291-294

在12000 a BP

前, 现代极端干旱的撒哈拉沙漠东  
北部就出现了代表湿润气候记录的  
湖相沉积; 全新世以来, 在9900—2  
400 a BP形成了众多的淡水湖泊,  
9800—6450 a

BP达到鼎盛时期。在6000 a  
BP—3600 a

BP前, 湖泊演化进入波动期, 反映  
了该时期气候环境周期性的变化并  
具600年的准周期。撒哈拉沙漠东北  
全新世湿润时期是该区古人类发展  
与进步、繁衍与分化的时期; 也是  
自然演变史上一个十分重要的时期  
, 其中强烈的风化作用和碎屑物质  
积累为今日撒哈拉沙漠的形成奠定  
了物质基础。

关键词: 撒哈拉沙漠 全新世  
古气候

叶佰生, 李世杰,

施雅风, 1997, 从末次冰盛期冰川  
规模探讨当时的气候环境,  
冰川冻土, 19(1): 1-9

根据乌鲁木齐河源区末次冰盛期形  
成的古冰川遗址和现代气候条件下  
冰川物质平衡与气候的关系, 结合  
冰川动力学模型估算出冰川到达末  
次冰盛期规模时的气候条件。依据  
末次冰盛期冰川面积, 结合冰川体  
积综合分析, 乌鲁木齐河源区末次  
冰盛期的夏季气温低于现代气温4.8  
℃左右, 降水约只有现代的30%。  
但目前其它古气候方法的研究结果

Zhang Hucai. 1997. Holocene climatic  
environment and human activities in the  
northeastern Sahara Desert. Journal of Desert  
Research 17(3):291-294.

The data for age determination from lake facies  
sedimentation in the northeastern Sahara Desert  
showed that there were a lot of large lakes in  
9900-2400 a BP. Moreover, the time 9800-6450  
years BP is a period of significant growth in the  
processes of lake forming. From 6000 years BP  
to 3600 years BP, the evolution of lakes arrived  
at its fluctuating period which corresponded to  
the changing climatic environment. This  
changing period lasted about 600 years. The  
humid period, represented by lake facies  
sedimentation in the Holocene in the  
northeastern area of the Sahara Desert, was also  
a period of development, progress, evolution,  
and differentiation of ancient human beings in  
this area, as well as the key period in natural  
evolutionary history. The heavy erosion and  
detrital accumulation in this period had laid a  
foundation of material source for forming the  
Sahara Desert.

Keywords: Sahara Desert, Holocene,  
paleoclimate



Ye Baisheng, Li Shijie, and Shi Yafeng. 1997.  
Investigation of climatic condition by the  
glacier extension in the Last Glacier Maximum.  
Journal of Glaciology and Geocryology  
19(1):1-9.

Based on glacial investigation well preserved in  
the headwater of the Urumqi River and  
relationship between glacier mass balance and  
climate in the contemporary climatic scenarios,  
this paper presents the estimated climatic  
scenarios in the Last Glacial Maximum (LGM)  
using glacier dynamics method. By combining  
the equilibrium line altitude (ELA) and glacier  
volume in the LGM, it is determined that  
summer air temperature in the headwater of the  
Urumqi River in the LGM was 4.8℃ lower than  
the contemporary temperature and the  
precipitation in that time accounted for  
approximately 30% of the contemporary one.

表明, 末次冰盛期的夏季气温比现代低 $5.6^{\circ}\text{C}$ 左右, 两者相差约 $0.8^{\circ}\text{C}$ , 造成差异的原因可能主要是冰川动力学方法没有考虑构造抬升对气温的影响。

关键词: 末次冰盛期 冰川 气候

However, other paleoclimatic studies demonstrate that the temperature in the LGM was  $5.6^{\circ}\text{C}$  lower than that at present. The difference of  $0.8^{\circ}\text{C}$  is attributed to the fact that ground surface uplift was not figured by the glacier dynamics method.

Keywords: Last Glacier Maximum, glacier, climate



施雅风, 郑本兴,

姚檀栋, 1997, 青藏高原末次冰期最盛时的冰川与环境, 冰川冻土, 19(2): 97-113

Shi Yafeng, Zheng Benxing, and Yao

Tandong. 1997. Glacier and environments during the Last Glacial Maximum (LGM) on the Tibetan Plateau. Journal of Glaciology and Geocryology 19(2):97-113.

在16—32 ka BP

的末次冰期最盛(LGM)时, 青藏高原环境有重大改变, 较现代降温 $7^{\circ}\text{C}$ 左右, 降水为现代的30%—70%。

极地型冰川广泛分布, 高原内部平衡线较现代下降值减至500—300m以内, 高原东部、南缘及西缘可能以亚极地型冰川为主, 平衡线下降800m以至1000—1200m。据统计, 包括周围高山在内的青藏高原冰川面积在 $35 \times 10^4$

$\text{km}^2$ 左右, 为现代冰川的7.5倍, 总冰量相当于全球海平面变化24.2cm。多年冻土在LGM时广泛发展, 面积达 $220 \times 10^4$

$\text{km}^2$ , 比现在扩大40%。海拔较低处受季风降水影响强烈的湖泊出现低水位或接近干枯, 海拔较高处受季风影响微弱的高原中西部湖泊呈现低于间冰期、高于冰后期的次高水位, 湖水含盐量增加, 柴达木出现多层石盐沉积。

关键词: 末次冰期最盛时 冰川 平衡线 湖泊 多年冻土

During the Last Glacial Maximum (LGM) at about 16-32 ka BP, it was  $7^{\circ}\text{C}$  colder than at the present and precipitation was 30% to 70% that of the present on the Tibetan Plateau. Polar-type glaciers developed extensively. The equilibrium line in the LGM was 300 to 500 m lower than at present and subpolar type glaciers might exist in the eastern, southern, and western edges of the plateau, with an equilibrium line altitude (ELA) decrease of 800 m or even up to 1,000-1,200 m. According to preliminary statistics, the glaciated area on the plateau in the LGM is about  $350,000 \text{ km}^2$ , 7.5 times larger than at present, and the ice volume on the plateau at that time was estimated to be about  $87,500 \text{ km}^3$  and equivalent to a decrease of 24.2 cm of the global sea level. Permafrost developed extensively to its maximum, about  $2,200,000 \text{ km}^2$ . Lakes in the eastern part of the plateau, which depended significantly on monsoon precipitation, shrank or even disappeared during the LGM. Those located in the northwestern part of the plateau had lower levels than in former interglacial stadial and higher than that during the post glacial period because of the effect of the westerlies. Almost all lakes on the plateau became saltier.

Keywords: Last Glacial Maximum (LGM), glacier, equilibrium line altitude (ELA), lakes, permafrost



## Climate Variation

秦大河,

李培基, 1997, 气候不稳定性的重要发现——对国外冰芯研究进展的综述, 地理学报, 52(5): 470-476

冰芯分析促进了气候环境变化研究的发展。通过对格陵兰冰盖顶部的一对冰芯的测定, 证实了末次冰期出现过多次冰段和间冰段的快速转换, 二者气温相差达 $5\sim 8^{\circ}\text{C}$ 。GRIP冰芯还发现末次冰期盛期也被冷期所打断。安第斯山冰芯揭示了末次冰期热带气候变化之谜。这些发现动摇了曾被普遍接受的气候稳定的间冰期和气候多变的冰期的结论, 恒温式热带冰期气候运转模式也受到挑战。对GISP2冰芯钻孔温度的测量, 解释了近4万年来地表气温的变化, 证实了极地对气候变化的放大作用。这同时也意味着未来温室效应导致的极地大陆冰盖不稳定性加剧和海面突变的灾难性结局是不容忽视的。

关键词: 冰芯 气候不稳定  
冰段和间冰段 热带气候敏感性

Qin Dahe and Li Peiji. 1997. Climate instability recorded in ice cores: An overview of recent findings by ice-core studies. *Acta Geographica Sinica* 52(5):470-476.

Analysis of ice cores drilled through Greenland and Antarctic ice sheets and high glaciers has made great progress in our study of the evolution of Earth's climate. One of the principal advances made by the Greenland Ice Core Project (GRIP) and Greenland Ice Sheet Project (GISP2) ice cores has demonstrated that the last glacial period was punctuated by a series of abrupt warm interstadials during which temperature increased by about  $5^{\circ}\text{C}$  to  $8^{\circ}\text{C}$  for a few hundred years. Another significant new finding documents that the Eemian interglacial was interrupted by a series of severe cold periods. In a third advance, two ice cores from the Andes open a view of the ice age tropics. And the last advance, analysis of the borehole temperature at GISP2 proves that polar amplification of climate change is a central characteristic of Earth's climate. With these new discoveries, the widely accepted concepts of a noisy glacial climate and a quiet interglacial climate as well as thermostatic tropic came under challenge. These discoveries also bring out questions about the consequences of future global warming. The greenhouse effect will end the recent climate stability and bring rapid climate change to our doorstep. We can not ignore all of these!

Keywords: ice core, climate instability, stadial and interstadial, tropic climate sensitivity

许国昌, 姚辉, 李珊, 1997, 中国干旱-半干旱区当代气候变化, 第四纪研究, (2):105-114

作者在最近几年有关研究的基础上, 结合最新资料和成果, 对我国干旱-

半干旱地区当代气候变化的基本趋势做了比较系统的分析,

并与全国及北半球气候变化相结合

。研究表明: 中国干旱-

半干旱地区气候变化与全国以及北半球气候变化相比有一定的特点。

冬夏气温变化不同, 干旱-

半干旱地区降水变化趋势不同。

关键词: 干旱-半干旱地区

气候变化

Xu Guochang, Yao Hui, and Li Shan. 1997. The present climate change in arid and semiarid region of China. Quaternary Sciences (2):105-114

On the basis of a recent investigation together with up-to-date information, the authors made a comparative study on the present climate changes in arid and semiarid regions of China. It revealed that the general trend of climate change in arid and semiarid regions of China was characteristic compared to that of all China and the entire Northern Hemisphere. Temperature variation is different between summer and winter in arid and semiarid regions. The trend of precipitation variation is also different in arid and semiarid regions.

Keywords: arid and semiarid regions, climate change



林志强, 1997, 全球平均海温演变的奇异谱分析, 气象, 23(9):31-34

应用奇异谱分析法 (SSA) 对1856—1991年全球平均海温季距平演变特征进行了研究, 并对各分量做了最大熵谱分析。研究表明, 海温演变除了具有81年的周期外, 另两个明显周期是准10年和2.6—6年。从各主分量的方差贡献来看, 前15个主分量的方差贡献之和是总方差的78%。从特征向量的分布函数来看, 第1、2特征向量的方差之和占总方差的48%。

其合成曲线基本描述了海温年距平在数年或数十年时间内的总体平均特性; 前四个分量的合成曲线能够很好的地拟合海温年变化特征。

关键词: 海温 奇异谱分析 主分量

Lin Zhiqiang. 1997. The singular spectrum analysis for global sea surface temperature anomaly. Meteorological Monthly 23(9):31-34.

The global sea surface temperature anomaly (SSTA) for the past 136 years (1856-1991) was studied with singular spectrum analysis, then a maximum entropy spectrum analysis for several principal components was conducted. The result shows that SSTA has several very evident periods of quasidecade and 2.6 to 6 years in addition to 81 years. The first fifteen principal components have a variance contribution of 78%. Eigenvector 1,2 stand for linear characteristic of SSTA, their variance contribution is 48%, and their resultant curve basically describes average trends during several years and several decades. Eigenvector 3 and later eigenvectors stand for wave characteristics of SSTA. The first four principal components can better fit SSTA yearly change characteristics.

Keywords: SSTA, singular spectrum, principal component

解思梅, 邹斌, 王毅,

包澄瀚, 1997, 南极海冰异常变化  
与全球海平面变化, 海洋学报, 19(1):  
27-37

通过分析1973-

1994年南极海冰的长期变化趋势和  
全球海平面的年际变化规律, 发现  
南极海冰80年代明显比70年代的海  
冰面积偏小, 海平面高度80年代平  
均值也明显比70年代偏高。这种变  
化标志着全球气候增暖。海水温度  
和大气温度的明显增高, 导致海冰  
长期累积的大量减少, 南极大陆冰  
盖向海洋输送冰川的数量也增多,  
这一切造成了海平面的明显上升,  
特别是太平洋尤为明显。南大洋水  
温偏高, 南大洋环流在南美大陆向  
北分支的秘鲁寒流水温也相对偏暖  
, 这就容易发生EI Nino 事件。

关键词: 南极海冰 全球海平面  
大洋环流 长期变化 EI Nino 事件

Xie Simei, Zou Bin, Wang Yi, and Bao  
Chenglan. 1997. The abnormal change of the  
Antarctic Sea ice and global sea level variation.  
Acta Oceanologica Sinica 19(1):27-37.

The long-term changing trend of the Antarctic  
sea ice and the annual variation of global sea  
level were analyzed. It was found that the area  
of the Antarctic sea ice was much smaller and  
that the global sea level was much higher in  
1980s than in the 1970s. This indicates that the  
global temperature has been increasing. Because  
of the higher air and water temperatures, the  
long-term accumulation of sea ice has been  
decreasing greatly and more and more of the  
glacier has been flowing to the ocean from the  
Antarctic ice sheet. All these influences caused  
the distinct increases in the global sea level,  
especially in the Pacific. Corresponding to the  
high water temperature in the South Ocean, the  
temperature of the Cold Wave has been  
increasing. So, an El Niño event is likely to  
occur.

Keywords: the Antarctic sea ice, global sea  
level, ocean circulation, long-term variation,  
El Niño event



王绍令, 1997, 若尔盖高原及其周  
围山地的冻土和环境,  
冰川冻土, 19(1): 39-46

若尔盖高原内部年平均气温0.6-  
3.3℃, 气温年较差19.1-  
21.2℃, 已不具备多年冻土形成和保  
存的气候条件。据1972年7月间试坑  
和钻孔测温, 在1.0-2.2 m  
深处地温为5-8.4℃, 浅层地下  
水温为6.0-7.8℃, 由此判断  
不存在多年冻土, 季节冻结深度为1  
.0-2.0 m。区内沼泽演化表明,  
部分沼泽已疏干或向疏干趋势发展

Wang Shaoling. 1997. Frozen ground and  
environment in the Zoige Plateau and its  
surrounding mountains. Journal of Glaciology  
and Geocryology 19(1):39-46.

Field investigation shows no permafrost in the  
interior of the Zoige Plateau. The mean annual  
air temperature is 0.6 to 3.3℃, and the annual  
range of air temperature is from 19.1 to 21.2℃.  
This is not cold enough to form permafrost.  
According to the temperature measurement  
from pits and boreholes (in July 1992), the  
groundwater temperature is 5.0 to 8.4℃ at a  
depth of 1.0 to 2.2 m, and the shallow ground  
temperature is 6.0 to 7.8℃. The seasonal frozen  
depth is 1.0 to 2.0 m. The swamp evolution  
reveals that a part of swamp has been drained  
and another part will be drained. The  
degeneration and desertification of grasslands

，草场退化和草原沙化已成为本区生态环境的重要问题，已影响到畜牧业的发展。

关键词：若尔盖高原 冻土  
环境演化

becomes an important problem to the ecological environment and impacts livestock.

Keywords: Zoige Plateau, frozen ground, environment evolution



孙东怀, 刘东生, 陈明扬,  
安芷生, 1997, 中国黄土高原红粘土序列的磁性地层与气候变化,  
中国科学, 27(3): 265-270

对西峰和西安红粘土剖面作了磁性地层研究, 表明黄土高原风成堆积和东亚古季风的发育至少自6.5 Ma BP前开始; 初步重建了磁化率变化反映的晚第三纪东亚夏季风气候的时间序列, 6.5-2.5

Ma红粘土磁化率值的逐步升高可能与青藏高原的隆起过程密切相关。黄土高原的风尘堆积速率在距今3.2 Ma以后显著增大, 反映了冰量对东亚冬季风和风尘堆积的影响。中国黄土高原风成红粘土序列记录的晚第三纪东亚古季风变迁可视为青藏高原隆起、太阳辐射与全球尤其是北半球冰量变化等多种因素相互作用的结果。

关键词：红粘土磁性地层 风成堆积  
季风变迁 青藏高原隆起

Sun Donghuai, Liu Dongsheng, Chen Mingyang, and An Zhisheng. 1997. Magnetostratigraphy and palaeoclimate of red clay sequences from Chinese Loess Plateau. Science in China (Series D) 27(3):265-270.

Two red clay profiles near Xi'an and Xifeng were investigated in an attempt to determine magnetostratigraphic and palaeoclimatic records. The results show that aeolian dust accumulation and the East Asia palaeomonsoon system had begun by 6.5 Ma. The late Tertiary palaeoclimatic history of the red clay as reflected by magnetic susceptibility is reconstructed during the period of 6.5 to 2.5 Ma. A stepwise increase in susceptibility of aeolian dust accumulation appears to have a close correlation to the uplift processes of the Tibetan Plateau. The remarkable increase of aeolian dust accumulation at 3.2 Ma appears to be a result of the influence of global ice volume on the East Asia monsoon. Palaeomonsoon variation during the late Tertiary as recorded in the red clay sequences from the Chinese Loess Plateau can be regarded as the product of a number of interacting factors, such as uplift of the Tibetan Plateau, solar radiation, global ice volume, etc.

Keywords: magnetostratigraphy of red clay, aeolian dust accumulation, monsoon variation, uplift of Tibetan Plateau

王绍令,

赵秀峰, 1997, 青藏公路南段岛状冻土区内冻土环境变化, 冰川冻土, 19(3): 231-239

将90年代的勘探、钻孔测温 and 地面综合调查等实测资料与70年代对比, 发现青藏公路南段岛状多年冻土区内的冻土退化和生态环境变化相当明显。表现为岛状多年冻土南界北移12

km, 多年冻土岛总面积减少7%。沼泽化湿地面积缩小约三分之一, 沼泽化草甸向草原化草甸逐步转化, 湖塘和洼地中的水生植物群落向湿、中生植物群落演替。草场退化严重, 少数地段土地沙化, 形成活动性沙丘, 目前区内的生态环境正向劣势方面发展。

关键词: 青藏公路南段 冻土退化 环境变化

Wang Shaoling and ZhaoXiufeng. 1997.

Environmental change in patchy permafrost zone in the south section of the Qinghai-Tibet Highway. Journal of Glaciology and Geocryology 19(3):231-239.

Comparison of the ground temperature and other investigation data in the 1990s with that in the 1970s, showed significant permafrost degradation and eco-environmental change in the patchy permafrost zone in the south section of the Qinghai-Tibet Highway. The southern limit of permafrost moved northward about 12 km. The area of patchy permafrost decreased 7%. The area of swamp land decreased about one-third. The swamp meadow gradually changed into grassy meadow, and the aquatic plants in lakes and low wetlands were replaced by moderate hydrophilous plants. Along with serious degradation of grassland, some lands underwent desertification and a movable sand dune formed. The eco-environment became worse gradually.

Keywords: southern section of the Qinghai-Tibet Highway, permafrost degradation, environmental change



陆龙骅, 卞林根,

贾朋群, 1997, 南极臭氧的短期气候变化特征, 应用气象学报, 8(4): 402-412

本文利用1957—1992年南极地区大气臭氧总量地面观测站资料, 对南极地区臭氧的时空变化特征进行了研究。结果表明: 虽然近35年来南极地区大气臭氧有较明显的减少趋势, 但在不同地区、时段和季节, 其变化趋势也不相同。近年来南极地区大气臭氧的显著减少主要是由于南极臭氧洞的形成和发展所造成的。南极地区的大气臭氧存在明显的年振荡、准20个月和准30个月

Lu Longhua, Bian Lingen, and Jia Pengqun.

1997. Short-term climatic change of Antarctic ozone. Quarterly Journal of Applied Meteorology 8(4):402-412.

In this paper, the spatial-temporal variations of Antarctic ozone are studied using the surface-observed data of Antarctic ozone from 1957 to 1992. The results show that during the last 35 years the mean total ozone in Antarctic has an obvious decreasing trend, but in different regions, periods, and seasons, there are great differences for the ozone variable trend. In recent years, the formation and the development of the Antarctic ozone hole caused the discrepancy in ozone data in the Antarctic. There exist obvious annual oscillation periods of approximately 20 and 30 months for Antarctic ozone. The ozone variations are closely related to astronomical sunshine, stratospherical temperature field, polar

的振荡周期。臭氧变化与天文日照、平流层温度场、平流层冰晶云及人类活动有关。

关键词: 南极地区 臭氧总量  
变化趋势 振荡周期

stratospherical ice crystal clouds, and the presence of man-made CFCs and halons, etc.

Keywords: Antarctic, total ozone, variable trend, oscillation period



**陈兴芳,**

**晁淑懿,** 1997, 台风活动的气候突变, 热带气象学报, 13(2): 97-104

通过近40年西太平洋和南海台风资料的分析, 发现台风活动有明显的气候振动, 并且在70年代前期发生气候突变, 表现为70年代前期以前台风数增多、台风偏强趋势; 70年代中期以后则相反, 为台风数减少台风偏弱趋势。80年代末台风数再次转为增多趋势, 但强度的气候趋势没有发生。分析表明, 台风活动的气候振动和气候突变与大气环流特别是西太平洋副高的气候变化有一定关系, 同时与赤道太平洋和北太平洋海温的气候变化有一定的相关。

关键词: 台风 短期气候振动  
气候突变

**Chen Xingfang and Chao Shuyi.** 1997. The shift in climate of typhoon activities. Journal of Tropical Meteorology 13(2):97-104.

Data on typhoons over the West Pacific and the South China Sea for the last 40 years show that the short-term climatic oscillation of typhoon activities is anomalous. Results show that the variation in typhoon activity had a climatic shift in the early 1970s. Before the climatic shift, the number of typhoons and intensity increased, but after that the tendency of variation is contrary. In addition, the increased number of typhoons during the recent years also suggests a climatic shift in the late 1980s, but the intensity of typhoons has not increased at present. Analysis indicates that the short-term climatic oscillation and the sudden climatic change is related to the climatic oscillation of general circulation and sea surface temperature especially to the West Pacific subtropical high.

Keywords: typhoon, short-term climatic oscillation, climatic shift

王敬方,

吴国雄, 1997, 持续性东北冷夏的变化规律及其相关特征, 大气科学, 21(5): 523-532

利用旋转主分量(RPC)方法, 分析近40年来我国夏季温度变化的规律。得到了表示东北冷夏变化的指标(NE TI)。利用该指标对东北气温和500hPa高度场, 以及全球SST进行时滞相关分析发现, 东北低温一般在当年5月开始, 持续至第二年4月结束, 构成一个“冷夏年”。而在前一年6月和后一年的6月有显著的暖夏, 呈现着准两年韵律的特征。东北冷夏的这种变化规律与大气环流异常关系密切。

关键词: 东北 冷夏 旋转主分量 时滞相关

Wang Jingfang and Wu Guoxiong. 1997.

Evolution and characteristics of the persistent cold summer in Northeast China. Scientia Atmospherica Sinica 21(5):523-532.

The method of rotational principal component (RPC) was used to diagnose the evolution of the air temperature in summer over China in the last 40 years. An index presenting the cold summer in Northeast China was obtained. Time-lagged correlation analysis between this index and the 500 hPa geopotential height of the Northern Hemisphere and the global sea surface temperature (SST) shows that the lower temperature in Northeast China usually starts in May and persists for about one year, which composes a “cold-summer year.” In addition, the monthly mean temperature in June in the preceeding year and that in the following year are significantly warmer than normal, showing characteristics with a “quasi-biannual” duration. It was shown that these characteristics are significantly linked to an anomaly of the atmospheric circulation.

Keywords: Northeast China, cold summer, rotational principal component, time-lagged correlation



张一平,

彭贵芬, 1997, 低纬高原城市昆明的气候特征, 高原气象, 16(3): 319-325

利用昆明城内的实测资料及城郊气象站的资料, 研究了低纬高原城市昆明城市内外的气候特征、变化规律及其差异。在此基础上, 探讨了低纬高原城市气候形成的机制, 为城市环境污染防治及城市建筑设计提供科学依据。

关键词: 低纬高原、城市气候、热岛效应

Zhang Yiping and Peng Guifen. 1997. The characteristics of urban climate of Kunming in low latitude and plateau area. Plateau Meteorology 16(3):319-325.

Observation of the microclimates was carried out at the surface in the city and suburbs of Kunming, China. The main results are as follows: the wind speed in the suburbs is larger than in the city, and differences in the daytime temperature of the city is higher than that of the suburbs, with differences larger at nighttime. Another result of the complicated thermodynamics in the city is the humidity in city is less than that in the suburbs, but its differences vary at different time, sky, and surface conditions.

Keywords: low latitude and plateau, urban climate, urban heat island effects

庞文保, 杨文峰,

李兆元, 1997, 陕西省夏季降水量的长期变化趋势, 高原气象, 16(3): 326-330

对陕西省榆林、西安、汉中夏季降水量的历年变化进行趋势分析, 并用灰色拓扑方法作了1996-2000年的趋势预测。分析表明, 关中的初夏旱和伏旱突出, 地处半湿润地区的西安夏季多年平均降水量比半干旱地区的榆林还少。自1951年以来, 陕西夏季降水量的总趋势是: 关中、陕南有下降趋势, 而陕北则不明显。此外, 关中、陕南夏季降水存在连续几年多雨或连续几年少雨的时期, 而陕北则呈现少雨年和多雨年交替出现的高频振荡。

关键词: 夏季 降水量 变化趋势

Pang Wenbao, Yang Wenfeng, and Li Zhaoyuan. 1997. Long-term trend of summer precipitation in Shanxi Province. Plateau Meteorology 16(3):326-330.

The trend of summer precipitation is predicted with the method of grey topology using summer precipitation data from stations at Yulin, Xi'an, and Hanzhong. Analysis shows that there are obvious droughts at the beginning and middle of the summer in the Guanzhong area. The mean summer precipitation in Xi'an (a semi-moist area) is less than in Yulin (a semi-drought area). Trends of summer precipitation have decreased in Guanzhong and the southern part of Shanxi Province since 1951, but the decreasing trend didn't change significantly in the northern part. In addition, more rain happened successively in Guanzhong and in the southern part, whereas high oscillation happened frequently in the northern part.

Keywords: summer, precipitation, variation trend



## East Asia Monsoon

许建军, 朱乾根,

施能, 1997, 近百年东亚季风长期变化中主周期振荡的奇异谱分析, 气象学报, 55(5): 620-627

依据1873-1990

年海平面气压场资料, 计算出东亚冬、夏季风强度指数, 并利用奇异谱分析方法对近百年东亚季风强度变化的周期性及周期振荡分量的年际、年代际特点进行分析。研究表明: 冬、夏季风都存在准2a (QBO), 3-6a (LFO) 年际振荡, 以及16-18a (IDO)

的年代际振荡和长期变化趋势。各振荡分量都具有年代际的差异, 其中QBO表现得最为典型。冬季风的

Xu Jianjun, Zhu Qiangen, and Shi Ning. 1997. The singular spectral analysis of periodic oscillation in long-term variation of East-Asian monsoon in recent century. Acta Meteorologica Sinica 55(5):620-627.

With sea level pressure data from 1873-1990, the paper calculates the East-Asia monsoon intensity index to analyze the periodic oscillation of East-Asian monsoon long-term variation in recent century using the method of singular spectral analysis (SSA). It indicates that: (1) Long-term variation in the East-Asian monsoon shows the interannual oscillation of the quasi-biennial (QBO) low-frequency oscillation (LFO) of 3-6 years and the interdecadal oscillation (IDO) of 16-18 years. (2) These oscillation components all exhibit the interdecadal variation and the QBO is particularly remarkable. (3) The amplitude of the QBO in winter monsoon is smaller before 1920s and shows a wavelike changing with greater amplitude of about 12 years and smaller



QBO在1920年以前振幅较小, 大约呈现12a大振幅和6a

小振幅的波状变化特征; 而夏季风则呈现6a大振幅和3a小振幅的波状变化。夏季风中的年代际变化影响较小。

关键词: 东亚季风、年际、年代际、奇异谱分析。

of about 6 years. (4) The summer monsoon changing is opposite that of the winter monsoon with about 6 years greater and about 3 years smaller. (5) The interdecadal variation in summer monsoon is dominant.

Keywords: East-Asian monsoon, interannual, interdecadal, singular spectral analysis



许建军, 朱乾根,

施能, 1997, 近百年东亚冬季风与ENSO循环的相互关系及其年代际异常, 大气科学, 21(6): 641-648

文章以东亚季风强度指数作为衡量冬季风强弱标准, 采用相关及滑动相关的计算技术, 研究了近百年东亚冬季风与ENSO循环的相互关系及其年代际变化。此研究表明: 1) 东亚冬季风的强弱变化与赤道东太平洋海温变化之间具有显著的年代际变化特征; 2) 季风与ENSO循环之间的关系受到季风的准两年振荡(QBO)以及季风-

海洋系统的年代际背景配置关系的共同作用; 3) 当季风与海洋背景场处于相同的位相时, 强冬季风有利于第二年冬季赤道东太平洋海温的升高, 产生EI

Nino事件; 当双方背景场处于反位相状态时, 强冬季风则对应于第二年冬季的La Nina事件。

关键词: 东亚冬季风 ENSO循环 年代际异常

Xu Jianjun, Zhu Qiangen, and Shi Ning.

1997. The interaction of East Asian winter monsoon with ENSO cycle and their interdecadal variations in recent century. Scientia Atmospherica Sinica. 21(6):641-648.

The interaction of the East Asian monsoon with the El Niño/Southern Oscillation (ENSO) cycle and their interdecadal variation in recent century are discussed using the method of coherence and moving coherence analysis. The results point out: (1) the relationship of the East Asian monsoon and the east equatorial Pacific sea surface temperature (SST) on the interannual time scale shows a distinct interdecadal variation; (2) the interaction of monsoons with the ENSO cycle is influenced by the quasi-biennial oscillation (QBO) in the monsoon and the phase relation of monsoons to SST on the interdecadal time scale; (3) when the interdecadal variation of the East Asian monsoon is in phase with that of the east equatorial Pacific SST, the strong winter East Asian monsoon is favorable to the temperature increasing in the east equatorial Pacific in the next winter and leads to El Niño event; and when the two air-sea systems are out of phase, the strong winter monsoon corresponds to La Niña in the next winter.

Keywords: East Asian winter monsoon, ENSO cycle, interdecadal variations

阎俊岳, 1997, 南海西南季风爆发的气候学特征, 气象学报, 55(2): 174-185

利用十多年的岛屿站、沿岸站、船舶观测记录及卫星观测的高反射云(HRC)资料, 研究南海西南季风爆发的过程及有关气候学特征, 包括环流场、云量场、降水场、海-气热交换场的迅速变化。南海西南季风爆发的平均时间为5月中旬, 其年际变化达一个月左右。西南季风的爆发使南海云量和降水量增多, 对流加强, 但各海区具有不均匀性。强对流区稳定在南海中部, 季风雨带之间没有明显的跳跃现象。在西南季风爆发一个月之前南海表层迅速升温, 为季风爆发提供了热量和水气条件。南海海面热交换分量在4月至5月间有明显改变, 尤其是潜热交换和蒸发量显著增大, 这可能是触发西南季风爆发的原因之一。

关键词: 南海 西南季风爆发  
气候学特征

Yan Junyue. 1997. Climatological characteristics on the onset of the South China Sea Southwest Monsoon. *Acta Meteorologica Sinica* 55(2):174-185.

According to the records of meteorological stations, marine ship observation data, and high reflective clouds (HRC) data by satellite remote sensing of more than ten years, the circulation patterns and variability in elements during the onset and the established periods of the South China Sea (SCS) southwest monsoon are discussed. The averaged date of the onset of the Southwest (SW) monsoon over the SCS occurs in the middle of May climatically, and the interannual range of the dates of onset is about one month. Following the onset of the SW monsoon, the cloud amount and the precipitation increase while the convection activities increase over the SCS. But there is a strong spatial variation within the domain. After the onset of the SW monsoon, the strong convective area moves northwards, while the SCS rain band moves to the center and north. The sea surface temperature (SST) increases rapidly before the onset and the leading time is one month. The increment of SST supplies heat and vapor for the onset. In April, the surface heat fluxes display obvious changes (e.g., latent heat exchange and evaporation enhancement). Increased SST is one of the reasons why the SW monsoon bursts first over the SCS.

Keywords: South China Sea, southwest monsoon onset, climatological characteristics

王启纬,

丁一汇, 1997, 南海夏季风演变的气候学特征, 气象学报,

55(4): 466-483

采用1980-1986年4-

9月ECMWF逐日次未初始化网格点资料和逐日两个时次(00时和12时)的OLR资料, 选取南海北部地区纬向风速、经向风速、高度、温度、湿度及OLR随时间的变化讨论南海夏季风的演变情况。结论如下:

南海北部5月第3候第1次跃升, 对流层高层东风和北风爆发, 东亚地区经向季风环流圈建立, 这标志着南海夏季风建立; 6月中旬, 南海纬向风速第2次跃升, 江淮流域梅雨季节开始; 南海北部地区对流层低层纬向风速、比湿盛夏呈双峰型, 纬向风速峰值分别出现6月第5候和8月第4候, 比湿突升略后于风速峰值出现的时间, 其峰值出现在6月6候和8月第5候。南海地区季风爆发前, 温度是波动式上升的, 爆发后是波动下降的。中国大陆东部及南海地区夏季对流层低层比湿有三次突变: 4月中旬南海北部出现高比湿中心, 而南海南部仍为最大比湿中心; 5月中旬最大比湿中心已从南海南部跳到南海北部—华南; 6月中旬—8月江淮流域比湿达到最大, 南海高比湿带消失。

关键词: 南海夏季风

孟加拉湾夏季风 气候学 突变

Wang Qiwei and Ding Yihui. 1997.

Climatological aspects of evolution of the summer monsoon over the northern South China Sea. *Acta Meteorologica Sinica* 55(4):466-483.

Some aspects of the climatology of the monsoon over the South China Sea (SCS) have been discussed using pentad mean European Center for Medium-Range Weather Forecasts (ECMWF) and Outgoing Longwave Radiation (OLR) data from April to September from 1980-1986. The studies revealed: that the onset of the northern SCS summer monsoon on the average is marked by the onset of the northerly at 200 hPa, the abrupt enhancement of the westerly at 850 hPa, and the formation of the meridional monsoon circulation of East Asia. Another abrupt enhancement of the westerly corresponds to the onset of Meiyu in the Yangtze River and Huaihe valley. The zonal wind and specific humidity appear with a two-peak pattern, and the abrupt increases of the zonal wind correspond well to the increase of the specific humidity. Before the onset of the summer monsoon, the temperature increases undulately, but drops down undulately after the onset. There are three abrupt changes in the distribution of specific humidity in East Asia. During the middle April, the humid band appears over the northern SCS; it suddenly jumps from the southern SCS to the northern SCS during middle May. From mid June to August, the high humid band appears over the Yangtze River and Huaihe valley and disappears over the southern SCS.

Keywords: SCS summer monsoon, Bay of Bengal summer monsoon, climatology, abrupt change

王启韦, 丁一汇, 1997,  
东亚冬季风的演变特征,  
应用气象学报, 8(2): 186-196

利用ECMWF的7年候平均资料讨论了东亚冬季风演变的特征, 并与南亚做了比较。研究发现, 东亚地区冬季风演变主要表现为10月中旬经向环流的突变及9月初、11月中旬和1月末对流层低层温度的3次突变; 而在南亚地区, 经向环流的变化不如东亚地区明显, 而且高层要先于低层变化, 对流层低层温度存在2次突变。整个冬季, 东亚地区冷涌的演变过程, 主要表现为南海地区冷涌在12月出现最高频率; 南亚地区冷涌也在12月出现最高频率, 但远小于东亚地区且衰减速度很快。另外, 东亚地区冷涌强度是向上衰减的, 南亚则是向上增强的。这些证明了东亚冬季风与南亚冬季风有本质的区别。  
关键词: 东亚冬季风 南亚冬季风 突变 冷涌

Wang Qiwei and Ding Yihui. 1997.  
Climatological characteristics of evolution of East Asian winter monsoon. Quarterly Journal Applied Meteorology 8(2):186-196.

This paper discusses the characteristics of the evolution of the East Asian winter monsoon and draws a comparison with those in South Asia. It found that there exists an abrupt change of meridional circulation in East Asia during the middle of October, which represents the onset of the East Asia winter monsoon circulation. Three abrupt changes of temperature occur in lower troposphere in early September, middle November, and late January. However, the change of the circulation in South Asia is not as strong as that in East Asia. The change of meridional wind in the upper troposphere is earlier than that in the lower troposphere. Two abrupt changes of the temperature in lower troposphere are weaker than in East Asia longitudinally. During the whole winter in East Asia, the frequency of cold surges has its maximum in the South China Sea in December, but in the western Pacific in January. On the other hand, in South Asia, the cold surges occur most frequently in December, but much less than in East Asia, and they decrease quickly with time. Another different aspect is that the cold surge frequencies decrease upward in East Asia, but increase in South Asia.

Keywords: East Asia winter monsoon, South Asia winter monsoon, abrupt change, cold surge



## Historical Climate Change

翟盘茂,  
任福民, 1997, 中国近四十年最高  
最低温度变化, 气象学报,  
55(4): 418-429.

深入研究了1951-1990年期间我国最高、最低气温以及气温日较差变化规律, 并探讨了可能影响的原因。(排除了由于测站迁移和城市热岛效应而对气候变化趋势的可能

Zhai Panmao and Ren Fumin. 1997. On changes of China's maximum and minimum temperatures in the last 40 years. Acta Meteorologica 55(4):418-429.

The paper discusses the spatial and temporal distributions of trends for maximum and minimum temperatures of China from 1951 to 1990 (minimizing the possible biases caused by station location and urban heat islands). It concludes that the increasing trends of maximum temperature are in the areas west to 95°E and north to the Yellow River, but

影响)。结论如下:

从地域分布上, 最高温度在黄河以北、 $95^{\circ}$  E以西以增温为主, 其他地方则以降温为主; 最低温度在全国表现出一致的增温, 但在不同地区 and 不同季节其变化趋势有较大差异。这种变化使得日较差表现出显著的变小趋势。最高、最低温度变化线性趋势表现出明显的不对称性。中国近四十年的增暖反映了温室效应作用的持续加强。由相关分析可知, 最高最低温度变化与日照条件及大气水分条件有关。

关键词: 最高温度 最低温度 变化

decreasing trends were observed in other areas. Minimum temperatures are generally increasing throughout China, but there are great differences in different areas and seasons. The result is a very obvious decreasing trend for temperature daily range. The increase of temperatures during the last 40 years reflects evidence of the enhancement of the greenhouse effect. Further analysis revealed that the changes of maximum and minimum temperatures are mainly related to sunshine duration and atmospheric water vapor content.

Keywords: maximum temperature, minimum temperature, change



洪光,

刘春光, 1997, 青岛市气候变暖的特征, 气象, 23(8): 55-57

利用青岛市近百年的气温资料研究了气温变暖的特征。青岛的年平均气温以 $0.05^{\circ}\text{C}/10$ 年的速度上升, 而年平均最低气温则以 $0.13^{\circ}\text{C}/10$ 年上升。在近百年的时间序列中, 后期气温明显高于前期, 尤其是近四十年来, 由于城市发展速度快, 城市化影响强烈, 所以在气候上反映出最低气温明显升高的趋势。

关键词: 气候变暖 特征分析  
青岛市

Hong Guang and Liu Chunguang. 1997. The characteristic analysis of climatic warming in Qingdao City. Meteorological Monthly 23(8):55-57.

The annual mean temperature for the last 90 years is warming at the rate of  $0.05^{\circ}/10$  years in Qingdao City, whereas the annual mean minimum temperature is warming at  $0.13^{\circ}/10$  years. In the time series, the annual mean temperature of later period is higher than that of the early days. The annual mean temperature for the last 40 years is warming faster than that of the past period, especially the annual mean temperature. The influence of Qingdao City development for the last 40 years on the climatic warming appears obvious in the minimum temperature increase.

Keywords: climate warming, characteristic analysis, Qingdao

王宝灵, 1997, 中国西北地区6月降水量最近30年明显递增, 气象, 23(6): 37-39

对中国西北五省(区) 89个测站标准三十年(1961—1990年)降水量月资料进行分析, 并采用了标准化处理。指出近三十年西北地区6月的降水量占全年降水总量的比例有明显增多趋势, 且变幅居各月之首。  
关键词: 中国西北地区 6月降水量 明显递增

**Wang Baoling.** 1997. A distinct increase of rainfall amount in June in Northwest China in the last 30 years. Meteorological Monthly 23(6):37-39.

Using monthly rainfall data from 89 stations in Northwest China from 1961 to 1990, the paper discusses the interannual and decadal change of precipitation in June. It points out that in the last 30 years the ratio of precipitation in June in Northwest China has an increasing tendency compared with the precipitation of the whole year, and this variation range ranked first every month.

Keywords: Northwest China, rainfall in June, distinct increase



陈兴芳, 1997, 1995—1996年冬季高原地区雪灾气候分析, 气象, 23(6): 40-43

研究了形成1995—1996年冬季我国高原东部地区严重低温雪灾的降水和平均环流异常之间的关系, 以及雪灾与高原地区冬季降水的气候振动和气候突变及其环流背景的关系。结果证明, 高原冬季降水和雪灾从60—90年代呈递增趋势, 并且目前仍处于冬季降水偏多时期, 因此雪灾的发生率也较多。

关键词: 青藏高原 雪灾 气候分析

**Chen Xingfang.** 1997. The short-term analysis of snow disaster over the Tibetan Plateau in winter 1995 and 1996. Meteorological Monthly 23(6):40-43.

The characteristics of precipitation and atmospheric circulation for snow disaster over the eastern part of the Tibetan Plateau in the winter of 1995 and 1996 are analyzed. The relationship between the climatic oscillation of the precipitation over Tibet and atmospheric circulation background is discussed. The results show that there is a tendency of increased snow disaster and precipitation in the winters from 1960 to 1990.

Keywords: Tibetan Plateau, snow disaster, climatic analysis

孙继敏, 丁仲礼, 1997,

近13万年黄土高原干湿气候的时空变迁, 第四纪研究, (2): 168-175

黄土高原这一特定地区, 其风成沉积序列在地域上的差异主要与东亚地区的季风环流在时间和空间上的变化有关。本文依据从毛乌素沙漠南缘到黄土高原南部的不同地域的土壤地层配置特点, 借助磁化率曲线, 探讨了近13万年来黄土高原季风环流在时空上的演变规律。此研究揭示出, 近13万年来, 最为显著的成壤期有6期, 与这6个成壤期对应的时段也应当是夏季环流加强、气候温湿的时期; 在空间上, 地层配置有较大变化, 全新世适宜期及末次间冰期中与深海氧同位素阶段5a, 5c, 5e对应的时期, 夏季风足可以深入到毛乌素沙漠腹地, 并具有占优势的环境效应。在阶段3的早、晚期及5b时期夏季风虽然也能深入沙漠—黄土边界带, 但其环境效应在黄土高原北部及毛乌素沙漠南缘已不再显著。在阶段2、阶段4及阶段3的中期夏季风已不能深入沙漠—黄土边界带。

关键词: 13万年 黄土高原  
干湿气候 时空变迁

Sun Jimin and Ding Zhongli. 1997. Spatial and temporal changes of dry and wet climate during the last 130,000 years in the Loess Plateau. Quaternary Sciences (2):168-175.

The aeolian sequences in the Loess Plateau mostly respond in a coherent fashion to the cyclic variation of the East Asian winter and summer monsoon circulation. Based on the characteristics of stratigraphic correlation from the Mu Us Desert to the Loess Plateau (along the N-S transect) and the magnetic susceptibility profiles, the paper probed into the spatial and temporal changes of monsoon circulation over the last 130,000 years. The results indicated that there were six dominant soil-forming episodes during the last 130,000 years. These episodes should coincide with the intensified summer monsoon circulation. There were also spatial variations in stratigraphic correlation. During the Holocene Optimum and the sub-stages of 5a, 5c, and 5e, the enhanced summer monsoon could easily reach the far interior of the Mu Us Desert and dominated. During the earlier and later periods of stage 3 and sub-stage 5b, the summer monsoon could still reach the marginal zone of Mu Us Desert, but the geological records show that the summer monsoon was not the dominant monsoon circulation. During the stage 2 and stage 4, as well as the middle of stage 3, the summer monsoon could not reach the desert-loess transitional zone.

Keywords: last 130,000 years, Loess Plateau, dry and wet climate, spatial and temporal changes

张丕远,

葛全胜, 1997, 过去气候演化的阶段性和突变, 地学前缘,

4(1): 122-126

地球系统的历史信息是评估全球变化的一项重要因素。以前在对过去气候研究中发现了气候的突然变化的现象, 突变证据大多出现在冰期、或由冰期向间冰期的过渡时期, 并认为这是冰盖的成冰与溶解过程造成海水铅直运动的结果。而近些年的研究又发现在间冰期中也出现突变。我国的历史文献、冰芯和沉积的高分辨率的古气候恢复工作发现近2000年来中国气候明显存在着突变事件。这又给我们提出了新的问题、即间冰期气候的稳定性问题。如果气候突变的证据增多, 这意味着气候系统很可能按两种方式进行。

关键词: 过去的气候 突变 间冰期末次冰期

Zhang Peiyuan and Ge Quansheng. 1997. Abrupt climate changes in the paleoclimate records. *Earth Science Frontiers* 4(1):122-126.

Historical information is an important factor in the assessment of global change. The paleoclimate records have shown that there were a lot of abrupt climatic changes at the global and regional level, in time scales, annual, and decadal and during the the periods of glaciation and transfer from one glacial period to another. Recently, some studies in China show that many abrupt climatic changes also existed in the Holocene interglacial, particularly in the past 2000 years. More and more evidence of abrupt climatic changes in the past is considered to be an important factor to prediction of climatic change in the future.

Keywords: paleoclimate, abrupt change, last interglacial, last glacial



范金松,

陈开喜, 1997, 近百年来南京降水变化的趋势和特征,

气象科学, 17(3): 235-245

对1905-1994年南京实测降水资料序列及其他统计特征进行了详细的分析, 判断出其降水变化特征及长期趋势。南京地区年降水量的长期变化经历了4个多雨期和3个少雨期, 40年代以前持续偏少, 40年代后直到现在有增多趋势, 而同期的气温变化几乎与其呈反位相; 南京地区降水的年际变化具有3.2年的显著周期; 90年代以来, 降水量异

Fan Jinsong and Chen Kaixi. 1997. Tendency and features of precipitation variation in Nanjing in this century. *Scientia Meteorologica Sinica* 17(3):235-245.

The data sequences of precipitation amount measured in Nanjing from 1905 to 1994 has been analyzed in detail. The results show that the annual precipitation amount in Nanjing has experienced such long-term variations that there are four periods with abundant precipitation and three periods with small amounts of precipitation. But the temperature variation of same period provided some kind of reverse phase. The outstanding period of interannual precipitation variation is 3.2 years. Since the 1990s, the phenomena of abnormal precipitation amounts are obvious and the number of years tends to increase.



常现象明显, 年数增多。

关键词: 统计特征 反位相

Keywords: statistic features, reverse phase



张顺利, 1997,  
西藏30年温度变化的气候特征,  
气象, 23 (2): 21-24

Zhang Shunli. 1997. The characteristics of temperature variation for 1961-1990 in Tibet. Meteorological Monthly 23(2):21-24.

利用西藏18个站1961-1990年的历年各月平均温度资料, 分析了西藏30年来温度变化的特征。结果表明: 各地年平均气温及冬季平均气温变化有较好的一致性, 从60年代到80年代逐渐增高。气温异常暖在全年各季都可能发生, 而异常冷则非常少见。22年、11年、4.4年、2-3年周期显著。西藏气温在后冬和夏季具有较好的持续性, 但在10-11月易发生转折。  
关键词: 温度变化 气候特征 西藏

According to the monthly mean temperature data of eighteen weather stations from 1961 to 1990, the variational characteristics of Tibetan temperature are analyzed. The results show that the monthly mean temperature is coldest during 1960s and is warmest during 1980s. In Tibet, an anomalous warmth may occur in different seasons, but anomalous cold is seldom. The 22-year, 11-year, 4.4-year and 2-3-year periodicity is significant. Temperature changes easily in October and November.

Keywords: temperature variation, climatological characteristics, Tibet



阎俊岳,  
李江龙, 1997, 东海及临近地区百年来的温度变化, 海洋学报, 19(6): 121-126

Yan Junyue and Li Jianglong. 1997. Climatic characteristics of the temperature variations in the East Sea and its adjacent areas during the last hundred years. Acta Oceanologica Sinica 19(6):121-126.

通过对东海及其临近地区1900-1987年的实地观测资料的分析, 研究了近百年来东海气温和海温变化特征及与临近大陆、岛屿温度变化的关系。结果表明, 东海气温与海温变化趋势一致; 冬季东海气温与西侧陆上气温相关系数高, 夏季东海水温与东侧岛屿气温相关系数较高; 东海气温、水温存在着冷2a周

Based on field observational information from 1900 to 1987, the characteristics of the temperature variations of air temperature and seawater temperature in the East Sea and its adjacent areas as well as the relationship between variation in these two temperatures in the nearby continent and islands are discussed. The results show that the trend of air temperature variations and the trend of water temperature variations in the East Sea are coincident. In winter the correlation coefficient of air temperature between the East Sea and its western lands is high, whereas in summer the correlation coefficient

期振动, 水温还有5-7a周期。

关键词: 东海 研究区 百年  
温度变化

of seawater temperature in East Sea to air temperature in its eastern island is high. There exists cold 2-year cycle oscillation in air and water temperatures in the East Sea and 5 to 7 year cycle oscillation in water temperature.

Keywords: East Sea, studied region, hundred year, temperature variations



张志华, 吴祥定, 1997,  
利用树木年轮资料恢复祁连山地区  
近700年来气候变化, 科学通报,  
42(8): 849-851

**Zhang Zhihua and Wu Xiangding.** 1997. The restoration of the temperature variations in the Qilian Mountain region during the last 700 years based on tree-ring information. Chinese Science Bulletin 42(8):849-851.

按照树木年轮气候学的基本原理和  
概念, 采用最新的分析程序,  
研究了年轮指数和温度、降水的关  
系。在此基础上,  
重建了一条祁连山地区过去湿润指  
数变化序列,  
探讨了该地区过去气候变化特征。  
关键词: 祁连山 树木年轮  
湿润指数 气候变化

According to the radical principle and concept of the dendroclimatology, the relationship between the tree-ring index and temperature, and precipitation are studied using the newest analytical program. A sequence of humidity index variations of the past in the Qilian Mountain Region is reconstructed, and the characteristics of past climatic variations in this area are also discussed.

Keywords: Qiliangshan, tree-ring, humidity index, climatic variation



尤卫红, 傅抱璞,  
林振山, 1997, 云南近百年气温变  
化与8月低温冷害天气, 高原气象,  
16(1): 63-72

**You Weihong, Fu Baopu, and Lin Zhenshan.** 1997. Climatic characteristics analyses of surface air temperature variations for Yunnan Province during the last one hundred years and chilling damage weather in August. Plateau Meteorology 16(1):63-72.

利用小波理论对云南近百年气温变  
化与8月低温冷害天气的气候学特征  
进行了分析。结果表明: 云南近百  
年来的气温变化主要经历了4个较大  
时间尺度的演变, 分别是1919年以  
前的偏冷期, 1920—1954年的偏暖  
期, 1955—1986年的偏冷期及

Using the multiresolving theory of wavelet analysis, the climatic characteristics of surface air temperature variations for Yunnan province during the last hundred years and chilling damage weather in August are analyzed. The results show that the surface air temperature variation for Yunnan Province can be divided into 4 hierarchies. They are the cold period before 1919, the warm period from 1920 to 1954,

1987年以后的偏暖期。对应于这4个层次演变,气温变化表现出了十分明显的突变特性,其冷暖交替的突变点分别发生在1920, 1955和1987年。云南8月低温冷害天气发生在1955—1986年这一较大时间尺度的偏冷期中。

关键词: 低温冷害天气 气温变化  
保留信息

the cold period from 1955 to 1986, and the warm period after 1987. The larger time scale's hierarchical changes for Yunnan Province obviously show features of a climate jump. The years 1920, 1955, and 1987 are the jump points of climate change. The chilling damage weather for Yunnan Province in August is mainly during the cold period from 1955 to 1986.

Keywords: chilling damage weather,  
temperature change, conserved information



王宇, 1997, 本世纪昆明气温异常及突变的分析, 高原气象, 16(1): 73-80

**Wang Yu.** 1997. Analysis of air temperature anomaly and catastrophe in this century in Kunming City. Plateau Meteorology 16(1):73-80.

根据昆明1921—1993年的年、夏季(6—8月)、冬季(12—2月)气温平均资料, 分析研究了昆明的气温变化趋势、冷暖阶段、气温异常发生频率及气温突变点。结果表明: 从本世纪20年代开始, 昆明气温呈上升趋势, 至40年代前后达最高, 此后下降, 70年代降至最低, 80年代略有回升。1921—1954年为偏暖阶段, 1955—1993为偏冷阶段。昆明高温异常出现在1950年以前, 低温异常出现在1960年以后, 且气温异常发生频率低。年平均气温突变点出现在1957年, 冬季平均气温突变点出现在1955年, 夏季平均气温未达到突变的标准。

关键词: 昆明 气温变化 气温异常  
气温突变

Based on mean air temperature data for annual, summer (6-8), and winter (12-2) from 1921 to 1993 in Kunming City, the air temperature changing tendency, cold and warm ranges, and frequency of air temperature and air temperature catastrophe are analyzed. The results show that air temperature rose from the 1920s, air temperature reached the maximum about the 1940s, and then fell down. It reached the minimum in the 1970s and rose slightly from the 1980s in Kunming City. The warm range is from 1921 to 1954 and the cold range from 1955 to 1993. The high-temperature anomaly appeared before 1950, low-temperature anomaly after 1960, and the frequency is low. Air temperature catastrophe appeared in 1957 for the annual mean, in 1955 for the winter mean, and no catastrophe for the summer mean.

Keywords: Kunming City, air temperature change, air temperature anomaly, air temperature catastrophe

廉毅, 安刚,

王琪等, 1997, 吉林省40年来气温和降水的变化, 应用气象学报, 8(2): 197-204

选用吉林省有代表性的10个测站, 用功率谱方法分析其40年来季节降水和气温变化趋势。结果表明: 吉林省气候短周期变化与东亚季风的年际振荡准3.5年(QTO)和准2年(QBO)周期基本是一致的。10年际季节气温变化表明, 冬季较50年代明显变暖, 升温2℃左右, 而夏季升温较弱, 但与50—70年代的夏季低温周期相比, 80年代以来进入了一个相当暖的周期。夏季副热带季风进退对吉林省的夏季气温和降水影响较大。

关键词: 气温 降水 振荡周期

Lian Yi, An Gang, Wang Qi et al. 1997. Variation of temperature and precipitation during the last 40 years in Jilin Province. Quarterly Journal of Applied Meteorology 8(2):197-204.

Using a data set from 10 representative stations in Jilin Province for 40 years and the power spectral method, the seasonal variation of temperature and precipitation were analyzed. The results show that a period of short-term climatic change in Jilin that is almost consistent with that of the interannual oscillation of quasi-3.5-year (QTO) and quasi-biennial (QBO) of the East Asia monsoon. Furthermore, it found that the seasonal temperature got warm clearly about 2℃ higher than that of the 1950s in winter, but weak in the summer. As compared with the low-temperature period in summer from the 1950s to the 1970s, the temperature was relatively warm during the period of 1980s. Also, progression or retrogression of the subtropical summer monsoon has a great effect on the temperature and precipitation of the summer in Jilin Province.

Keywords: temperature, precipitation, oscillation period



江志红, 丁裕国,

金莲姬, 1997, 中国近百年气温场变化成因的统计诊断分析, 应用气象学报, 8(2): 175-185

利用BP-CAA方法, 诊断中国近百年(1881—1992)气温场变化之成因。结果表明: (1) CO<sub>2</sub>浓度增加所导致的温室效应加剧, 与中国近百年增暖趋势的关系最为密切; (2) 80年代后, 温室效应加剧所引起的主导作用更加明显, 相应敏感区位于华北北部、东北、西北西部及长江中下游地区; (3) 火山活动对气温变化的长期趋势所叠加的波动变化起

Jiang Zhihong, Ding Yuguo, and Jin Lianji. 1997. Statistical-diagnostic analysis of cause for the characteristic of China's temperature field during the last 100 years. Quarterly Journal of Applied Meteorology 8(2):175-185.

The cause for the changes in China's temperature fields during the last 100 years (1881-1992) is diagnosed using the canonical correction analysis (CAA) method. The results show that: (1) The enhanced greenhouse effect due to the increase of CO<sub>2</sub> is closely correlated with the linear trend of warming in China's temperature fields and the relationship appears more obvious since the 1980s. (2) The sensitive regions of the greenhouse effect are located in northern North China, Northeast China, western Northwest China, and the mid-lower reaches of the Changjiang River. (3) The effect caused by volcanism is of relative importance in the fluctuations in long temperature trends, and the

主要作用, 敏感区位于 $35^{\circ}$  N以南, 中心位于西南地区; (4)

20年代至40年代增温可能是温室效应、火山活动和太阳活动多种因素综合作用的结果, 而70年代以来的增温主要与温室效应的加剧有关。

关键词: 典型相关分析 气候变化 温室效应

sensitive region lies to the south of  $35^{\circ}$ N, with the center in southwestern China. (4) The warming from the 1920s to the 1940s seems to be the joint result of the greenhouse effect, volcanism, and solar activity, and by the end of the 1970s may be mainly caused by an enhanced greenhouse effect.

Keywords: canonical correlation analysis (CAA), climatic variation, greenhouse effect



邓自旺, 林振山,

周晓兰, 1997, 西安市近50年来气候  
变化多时间尺度分析,  
高原气象, 16(1): 81-93

利用Morlet小波变换法分析了西安市近50年月平均气温距平和月降水量距平变化的多层次时间尺度结构, 发现西安市气候变化除1年的自然周期变化和20—40年尺度范围的周期变化信号在全时间区域中都强外, 其它时间尺度的周期变化在时间域中分布很不均匀, 具有很强的局部化特征。西安市月平均气温距平变化主要表现为随机振荡, 无特征尺度, 而月降水量距平变化则有显著的4—5个月的时间尺度。对于大时间尺度来讲, 西安市气候呈暖干和冷湿结构排列, 而对于小时间尺度而言呈现为复杂的冷暖和干湿结构。

关键词: 气候变化 时间尺度 周期  
Morlet小波变换

Deng Ziwan, Lin Zhenshan, and Zhou Xiaolan. 1997. Multiple time scales analysis of Xi'an climate change for the last 50 years. Plateau Meteorology 16(1):81-93.

Using the Morlet wavelet transformation, the anomalies of monthly mean temperature and monthly precipitation in Xi'an for the last 50 years are analyzed. The results show that the periodic variations are localized in the time domain with a 1-year natural period and 20 to 40 year long-term variations. Because of the special geographic location, the relationships between the climate variation in Xi'an and the El Niño/Southern Oscillation (ENSO) are not strong. The combinations of cold/warm and wet/dry climate states are different in long and short time scales. Climate change is regular on the long time scale, but the climate variation is random and complex on short time scales. Temperature variation is mainly random whereas the precipitation changes with a characteristic scale of 4-5 months.

Keywords: climate change, time scale, period, Morlet wavelet transformation

马晓波,

高由禧, 1997, 中国西北地区和蒙古国40年气温时空特征及其变化趋势, 高原气象, 16(3): 282-291

利用我国西北地区及蒙古国共59个台站(作EOF分析时取25个站)1951—1990年逐月平均气温资料, 采用EOF法分析了该地区40年来气温场不同季节的空间分布特征及其随时间变化的规律。结果表明气温场的空间分布主要有三种类型:

(1)全区一致型, (2)南北差异型, (3)东西差异型。各月、季、年的变化周期主要集中在三个时段: 2-

4年, 5-8年和10-

13年, 夏季以短周期为主, 冬季和年主要是长周期。气温变化趋势的空间分布不均匀, 全区年、冬季升温, 夏季降温, 春、秋季则有升有降, 幅度不大。

关键词: 西北地区 气温 时空特征 变化趋势

陈兴芳,

宋文玲, 1997, 近10年我国降水的QBO分析, 应用气象学报, 8(4): 469-476

近10年来我国东部地区降水分布趋势的年际变化具有QBO特征, 双年的降水为中部地区少南北多, 单年的降水为中部多南北少, 其中江淮流域的降水变化最明显。分析表明, 降水QBO的特征与西太平洋副高和冷空气活动有关, 一般双年副高偏北、亚洲纬向环流发展, 雨带偏北; 单年相反, 副高偏南, 亚

Ma Xiaobo and Gao Youxi. 1997. Spatial and temporal characteristics and variation trend of air temperature in Northwest China and Mongolia in the last 40 years. Plateau Meteorology 16(3):282-291.

In this paper, monthly mean air temperature data from 59 stations in Northwest China and Mongolia from 1951 to 1990 are analyzed using the empirical orthogonal function (EOF) method (for 25 stations) to find out its spatial and temporal characteristics. There are three kinds of spatial distributions: (1) seasonal variation in all areas is identical, (2) north-south distribution, and (3) west-east distribution. The main variation periods are 2-4, 5-8, and 10-13 years; shorter periods dominante in summer, and longer periods in the winter and the whole year. Spatial distributions of air temperature trends are nonuniform. The mean air temperature rises in winter and annually, falls in summer, and rises or falls in spring and autumn, but the variation amplitude is small.

Keywords: Northwest China, air temperature, spatial and temporal characteristics, variation trend



Chen Xingfang and Song Wenling. 1997.

Quasi-biennial oscillation analyses precipitation in China from 1986 to 1995. Quarterly Journal of Applied Meteorology 8(4):469-476.

During the last 10 years, the interannual changes of the precipitation distribution tendency in eastern China are characteristic of quasi-biennial oscillation (QBO). The precipitation in even-numbered years is less in central China and more in northern and southern areas, whereas the precipitation in odd-numbered years is contrary with more precipitation in the central area and less in northern and southern parts. The feature of precipitation change in the Changjiang- Huaihe River basin is the most obvious. The results show that the QBO feature of precipitation is related to the West Pacific subtropical high and

洲经向环流发展,雨带偏南,江淮流域降水较多。

关键词:夏季降水 准两年振动  
副热带高压 冷空气活动

cold air actions. Generally, in even-numbered years, the subtropical high is north of its normal position, the zonal circulation of Asia develops, and a corresponding rain belt moves northward. The condition for odd-numbered years is the opposite.

Keywords: summer precipitation, quasi-biennial oscillation (QBO), subtropical high, cold air activities



王宁练,

刘时银, 1997, 从天山乌鲁木齐河源1号冰川变化估计近百年来该地区夏季升温, 冰川冻土, 19(3): 207-213

文章依据冰川变化来定量地研究气候变化, 通过近百年来天山乌鲁木齐河源1号冰川的变化, 确定其平衡线的变化, 再依据该冰川平衡线的波动与气候要素之间的关系揭示出本世纪以来该河源地区的气候变化幅度, 其中夏季气温上升了约0.23-0.25℃; 同时, 对于该冰川不同长度规模时的气候敏感性也进行了分析。

关键词: 天山1号冰川 冰川变化  
平衡线 气候敏感性 气候变暖

Wang Ninglian and Liu Shiyin. 1997. Summer temperature rise quantified from the change of Glacier No.1 at the source of the Urumqi River in the 20th century. *Journal of Glaciology and Geocryology* 19(3):207-213.

In this paper, an attempt is made to reveal climate change by analyzing glacier fluctuation quantitatively. The equilibrium line can be determined from the change of Glacier No. 1 at the source of Urumqi River in the Tianshan Mountains. Based on the correlation between the fluctuation of the equilibrium line and climatic factors, summer temperature has risen about 0.23-0.25℃ in this source area since the beginning of this century. Meanwhile, the climate sensitivity of the glacier under its different lengths is discussed.

Keywords: Glacier No.1 at the source of Urumqi River, glacier fluctuation, equilibrium line, climate sensitivity, climate warming

潘保田, 陈发虎, 1997,

青藏高原东北部15万年来的多年冻土演化, 冰川冻土, 19(2): 124-131

根据多年冻土遗迹特别是具有良好环境指示意义的冰楔假型和原生砂楔, 证明青藏高原东北部最近15万年中至少存在4次多年冻土大规模扩展时期。分别是: 140 ka BP的倒数第二次冰期, 各地广泛发育冰楔; 末次冰期早期(80—53 ka BP), 若尔盖盆地发育融冻扰曲; 末次冰期最盛前期(27—23 ka BP), 高原东北缘出现冰楔; 末次冰期最盛后期(21—10 ka BP), 巴颜喀拉山以南地区和若尔盖盆地发育冰楔, 黄河源、共和及青海湖周围出现原生砂楔。不考虑构造抬升, 上述冻土扩展时期多年冻土带下界高度较现代低1700—1800 m。

关键词: 冻土演化 冰楔假型  
原生砂楔 青藏高原东北部

张顺利,

黄晓清, 1997, 拉萨40余年温度变化的气候特征, 高原气象, 16(3): 312-318

利用拉萨1952—1995年共44年逐月月平均气温资料, 分析了拉萨温度变化的气候特征和影响因子。分析表明, 44年来拉萨经历了暖—冷—暖—冷—暖5个时期, 其中60年代是一长时期的冷期, 四季明显; 80年代以来是一长时期暖期。拉萨

Pan Baotian and Chen Fahu. 1997. Permafrost evolution in the northeastern Qinghai-Tibetan Plateau during the last 150000 years. Journal of Glaciology and Geocryology. 19(2):124-131.

Based on traces of permafrost, ice-wedge casts and fossil sand wedges are environmental indicators. There were at least four periods in which permafrost intensity expanded during the last 150 ka BP in the northeastern Qinghai-Tibetan Plateau. The first period, in which ice wedges developed extensively, was the penultimate glaciating period 140 ka BP. The second period was the early Last Glacial (80-53 ka BP), when involution appeared in the Zoige Basin. Ice wedges developed in the Gonghe Basin and the Qinghai Lake region in the third Period (27-23 ka BP). In the fourth period from 21 to 10 ka BP, the regional differences of the natural environment became very clear. Ice wedges developed in the Zoige Basin and Bayanhar Mountain because of the humid and cold climate. However, sand wedges appeared in the source of the Yellow River, Gonghe Basin, and Qinghai Lake region because of the dry and cold climate. The altitudes of lower limits of the permafrost zone in the cold periods were 1700-1800 m lower than at the present, leaving out the tectonic uplift.

Keywords: permafrost evolution, ice-wedges casts, fossil sand wedges, the northeastern Qinghai-Tibetan Plateau



Zhang Shunli and Huang Xiaoqing. 1997. The climatological characteristics of temperature variation more than forty years in Lhasa. Plateau Meteorology 16(3):312-318.

Using monthly mean temperature data from 1952 to 1995, the paper analyzes the 44 years variational characteristics of Lhasa temperature. It shows that in the last 44 years, there are warm-cold-warm-cold-warm evolution processes for Lhasa temperature, with a long cold period in the 1960s and a warm period in the 1980s to the 1990s. Temperature of Lhasa has good persistence in spring and summer, but this persistence is subject to change in August to September and December to January. The 3-



温度在春、夏季稳定性强, 持续性好, 但在8—9月和12—1月温度持续性会发生转折; 各季及年平均温度变化有3年短周期和11年、12年长周期。拉萨温度异常具有持续性、阶段性和突变性, 主要受中纬度环流和太阳黑子的影响。

关键词: 温度 气候特征

year, 11-year and 22-year periods are significant. Middle-latitude circulation and sunspot activity mainly affect Lhasa temperature.

Keywords: temperature, climatological characteristics



## Impact

周筠钧,

周立华, 1997, 青海湖流域沼泽化草甸形成发育的主要气候因子, 中国沙漠, 17(3): 271-277

青海湖流域的沼泽化草甸的形成、发育和时空分布在一定程度上取决于生态环境中的一些主要气候因子:  $\geq 10^{\circ}\text{C}$  的积温、5—9月份的降水和年湿润系数。据此作出了湿地率与该环境形成发育的主要气候因子的数学模型。

关键词: 青海湖流域 沼泽化湿地形成发育 主要气候因子

**Zhou Yunjun and Zhou Lihua.** 1997. The main meteorological factors of formation and development of paludification meadow in the Qinghai Lake drainage area. *Journal of Desert Research* 17(3):271-277.

The paludification meadow in the Qinghai Lake drainage area is an ecosystem affected by eco-environmental factors. Its formation, development, and spatial and temporal distribution are governed by a few main meteorological factors in the eco-environment to a certain extent. The main meteorological factors are  $\geq 10^{\circ}\text{C}$  accumulated temperature, precipitation from May to September, and annual humidity coefficient. A mathematical model of the wetland rate and the main meteorological factors are given by multivariate linear regression in the paper.

Keywords: Qinghai Lake drainage area, paludification wetland, formation and development, main meteorological factors

李英年, 张景华, 1997,  
祁连山气候变化及对高寒草甸植物  
生产力的影响,  
中国农业气象, 18(2): 29-32

分析了祁连山近36年来气候变化特征, 以及对高寒草甸植物生产力和种群结构变化的影响。结果表明: 祁连山年平均气温以10年 $0.15^{\circ}\text{C}$ 的速度增高; 年平均气温的增高与冷季气温升高相关, 暖季气温虽有升高现象, 但对平均气温升高贡献不大。降水量基本在多年平均值上下振动, 无明显变化趋势, 但降水变率略有增大。在这种下, 高寒草甸植物生产力有所下降, 植物种群数量、结构也发生新的变化。  
关键词: 高寒草甸 生产力 气候变化 祁连山

Li Yingnian and Zhang Jinghua. 1997. The effect of climatic changes on biomass production of alpine meadow plants in Qilian Mountain. Agricultural Meteorology 18(2):29-32.

The paper analyzes the characteristics of climatic changes and their effect in the last 36 years. The results show annual average temperature rises of  $0.15^{\circ}\text{C}/10$  years. This rise in annual average temperature is associated with the temperature raising in the cold season; the rise in the warm season contributed a little to annual average temperature. Precipitation usually oscillates with average value for many years and has no obvious trend to change, but the precipitation rate increased slightly. In this case, biomass production of alpine meadow plants decreased, and the number and construction of community show new changes.

Keywords: alpine meadow, biomass production, climatic change, Qilian Mountain



王廷贵, 潘成英, 1997,  
济宁地区水稻生产与气象因子关系  
分析, 气象, 23(9): 43-45

利用济宁市31年(1964-1994年)的水稻产量资料和气象资料, 分析了其水稻生产的不同气候年型、产量与气象因子的关系, 找出了影响产量变异的关键时期和主导气象因子及其时间变化规律, 并探讨了相应的对策措施。

关键词: 水稻 产量 气象因子 对策

Wang Tinggui and Pan Chengying. 1997. The relationship between rice production and meteorological factors in the Jining District. Meteorological Monthly. 23(9):43-45.

The paper analyzes the relationship between meteorological factors and the type and yield of production using rice yield and meteorological data in the Jining district from 1964 to 1994. The main period of yield variability, the principal meteorological factors, and the varying rule are given, and countermeasures that respond to unfavorable factors are suggested.

Keywords: rice yield, meteorological factors, countermeasure

**田贻品**, 1997, 连云港市80年代以来的气候特点及其对国民经济的影响, 气象科学, 17(1): 96-101

根据实际观测资料, 采用相关分析法, 研究了连云港市的气候变化特征。80年代以来, 连云港市气候变化的主要特点是: 冬季温暖且雨雪多, 而盛夏气温略有下降且雨量明显减少, 春季降水强, 干旱现象频繁发生, 寒潮低温危害严重。在此基础上还分析了其形成的形势背景及对国民经济产生的影响。

关键词: 气候特点 经济影响

**Tian Yipin**. 1997. The climatic characteristics of Lianyungang since the 1980s and their impact on national economics. Scientia Meteorologica Sinica 17(1):96-101.

Based on field observation, the characteristics of climate variations in Lianyungang are discussed. The report points out that since the 1980s the air temperature increases in winter but has a slight decrease in midsummer; there is precipitation in winter and spring and less precipitation in midsummer; the drought occurred frequently; and cold waves and microtherms cause serious injury. The background of these climatic characteristics and impacts on the national economics are also analyzed.

Keywords: climatic characteristics, impact on economics



**冯明**, 1997, 湖北省气候变化及其对夏收作物的影响, 中国农业气象, 18(4): 36-41

通过对80年代以来湖北省气候变化的分析研究, 揭示了其气候变化的基本规律, 分析了其对夏收作物的影响。结果发现: 冬季变暖、夏季变凉是湖北气候变化的主要特点, 年平均气温变化是以降温为主。气候变化加强了各种气象因子对小麦和油菜产量的影响。

关键词: 气候变化 地理分布  
夏收作物

**Feng Ming**. 1997. Climate change and its effects on summer harvesting crops in Hubei Province. Agricultural Meteorology 18(4):36-41.

Through detailed analysis on climate change in the period of 1981-1994 in Hubei Province, it was found that the gradual lowering of the yearly mean temperature and the climate getting warmer in winter and colder in summer were the main features of climate change in Hubei Province. These factors had obvious effects on the yields of wheat and rape-seed oil.

Keywords: climate change, geographic distribution, summer harvest crop

林举宾, 涂悦闲,

麦建辉, 1997, 农业气象灾害对广东水稻生产的影响及防御措施, 中国农业气象, 18(4): 42-45

从农业气候角度分析了影响广东水稻生产的主要气象灾害及其减产原因, 并提出了防御对策, 以促进广东水稻稳产高产。

关键词: 水稻 农业气象灾害 对策

Lin Jubin, Tu Yuexian, and Mai Jianhui.

1997. The impacts of climatic disaster on rice production and countermeasure for defense in Guangdong. Agricultural Meteorology 18(4):42-45.

This paper analyzes the climatic disasters that affect the yields of rice in Guangdong and the reasons for decreases in yields. Countermeasures to accelerate rice generation and maintain steady and high growth are pointed out.

Keywords: rice, agrometeorological disaster, countermeasure



王春红, 蒋全荣,

余志豪, 1997, 北极III区海冰面积低频变化对北半球冬季大气环流异常的作用, 大气科学, 21(1): 123-126

讨论了北极III区 ( $70^{\circ}\sim 160^{\circ}\text{E}$ , 年平均海冰面积约200平方纬度) 海冰面积变化与冬半年 (11~4月) 大气遥相关的联系问题。揭示出: 1) 北极III区海冰面积变化具有40个月左右 (3~4年) 的低频振荡周期。2) 北极III区海冰面积的低频变化所引起的热力强迫作用, 可以激发产生EA型及类似于WP的大气遥相关型。冰气系统之间存在着3~4年的不规则振荡, 在振荡过程中, 它们是相互作用的。3) 北极III区海冰面积异常对北半球冬季大气环流异常的影响。对比表明, 在重冰年和轻冰年, 北半球冬季中纬度地区大气环流以及我国的天气气候特征有十分明显的差异。

关键词: 北极III区 海冰面积 大气环流异常 EA型

Wang Chunhong, Jiang Quanrong, and Yu

Zhihao. 1997. Effect of low-frequency variability of the Region III Arctic sea ice cover on the Northern Hemisphere atmospheric general circulation anomaly in winter. Scientia Atmospherica Sinica 21(1):123-126.

The paper discusses the issues of teleconnection between the Region III Arctic sea ice cover variation and winter atmosphere. It shows: (1) Region III Arctic sea ice cover has a low-frequency variation of 3 to 4 year cycle. (2) The Eastern Atlantic (EA) pattern teleconnection and teleconnection like that of the western Pacific (WP) can be aroused by the low-frequency variability of the Region III Arctic sea ice cover. The irregular fluctuation of 3 to 4 years exists in the ice-air system. In the process of this fluctuation, the ice and the air affect each other. (3) The characteristics of the atmospheric circulation in winter in the mid-latitude region of the Northern Hemisphere and the characteristics of the weather-climate in China show the distinct difference in the heavy ice years and in the light ice years of the Region III Arctic sea ice cover.

Keywords: Region III sea ice cover, atmosphere general circulation anomaly, Eastern Atlantic (EA) pattern

**傅抱璞**, 1997, 我国不同自然条件下的水域气候效应, 地理科学, 17 (3): 246-253

根据分布在我国不同自然条件下的26个湖泊、水库和河流的实际观测资料和数据, 并结合理论分析, 阐明了各种水域在不同自然条件下气候效应的特点和规律, 并提供了其对温度、湿度、风速和降水正负影响的大致数值范围。

关键词: 水域 气候效应 自然条件

**Fu Baopu**. 1997. The climatic effects of waters in different natural conditions. Scientia Geographica Sinica 17(3): 246-253.

This paper presents studies of the climatic effects of waters in different natural conditions based on theoretical analysis and the observational results of twenty-six waters located in various regions in China. It also offers approximate numerical value ranges of positive and negative influences on temperature, humidity, wind speed, and precipitation.

Keywords: waters, climatic effects, natural condition



**刘云鹏**, 1997, 宜昌温度变化的统计特征及对农业生产的影响与对策, 中国农业气象, 18(2): 36-39

通过对宜昌站1952~1991年的气温、积温等温度指标年际变化的统计分析, 发现近40年来宜昌年平均气温大约以 $0.11^{\circ}\text{C}/10$ 年的倾向率下降, 两端温度趋于缓和, 夏季降温趋势明显。积温减少, 夏、秋季低温冷害日渐突出, 已对农业生产构成严重威胁。针对这种情况, 提出了相应的对策和措施。

关键词: 温度 年际变化 统计特征 农业影响 对策

**Liu Yunpeng**. 1997. The statistical characteristic of temperature variation in Yichang and its influence on agricultural production and countermeasures. Agricultural Meteorology 18(2): 36-39.

In recent years, annual mean temperature has been dropping at rate of about  $0.11^{\circ}\text{C}$  per ten years in Yichang. The lowest and highest temperatures in a year tend to be subsiding. The trend of temperature dropping in summer is most obvious. Because the accumulated temperature has decreased and cool injury has gradually become more significant, agricultural production has been seriously imperiled. The paper also proposes some suggestions and countermeasures.

Keywords: temperature, interannual variation, statistical characteristic, influence on agriculture, countermeasure

郑有飞, 万长建, 许维新, 1997,  
未来气候变化时南京地区冬小麦气  
候生产潜力估算,  
中国农业气象, 18(3): 14-18

根据试验结果, 研究了紫外线辐射  
增加对小麦产生的影响, 包括导致  
小麦植株变矮、长势变差、生理活  
动受阻、产量下降等。在此基础上  
, 综合评价了气候变化对小麦的影  
响, 并对CO<sub>2</sub>

倍增后南京地区冬小麦气候生产潜  
力进行了估算。

关键词: CO<sub>2</sub>倍增 小麦 紫外辐射  
气候生产力

郭恩华, 陈海平, 1997,  
季风与地形对台湾降水的影响, 热带  
地理, 17(1): 23-29

通过对季风环流的季节变化及地形  
对台湾降水的影响的分析,  
得出以下结论: 东北季风和地形的  
共同影响造成了冬半年台湾北部多  
雨和西南部干旱; 夏半年由于受西  
南季风的影响, 出现了岛西部降水略  
多于岛东部的现象,

且缓解了西南部干旱。台湾地形对  
降水的影响居全国之冠, 海拔每上升  
100m, 年降水量递增值都大于  
100mm。

关键词: 季风 地形 降水 递增值  
台湾

Zheng Youfei, Wan Changjian, and Xu  
Weixin. 1997. Estimation of production  
potential of wheat in Nanjing influenced by  
future climatic changes. Agricultural  
Meteorology 18(3):14-18.

The experiment conducted showed that  
enhanced solar ultraviolet (UV) radiation could  
produce negative effects on wheat, leading to  
shortened plants, poor growth, inhibition of  
normal physiological activities, and decrease in  
yield. Based on the overall evaluation of  
climatic changes on wheat production, estimates  
of climatic production potential were obtained  
for winter wheat grown in Nanjing under a  
doubling CO<sub>2</sub> concentration.

Keywords: CO<sub>2</sub> doubling, wheat, UV radiation,  
climatic production potential



Guo Enhua and Chen Haiping. 1997. The  
effects of monsoon and landform on rainfall in  
Taiwan. Tropical Geography 17(1):23-29.

The paper analyzes the impacts of seasonal  
variations of monsoon circulation and landform  
on precipitation in Taiwan. It reports that in the  
winter half of the year, the plentiful rains in the  
northeast part and the drought in the south-  
western parts are caused by the joint effect of  
the northeast monsoon and landform. In the  
summer half, the rainfall in the western part of  
the island is slightly more than that in the  
eastern part at the same latitude. The southwest  
monsoon rainfall in summer has the major  
contribution to alleviating the drought in the  
southwest. The altitude increase rate of annual  
rainfall is rather high, more than 100 mm per  
100 meters of altitude.

Keywords: monsoon, landform, rainfall,  
increase rate, Taiwan

张强, 胡隐樵, 赵鸣, 1997,

降水强迫对戈壁局地气候系统水、  
热输送的影响, 气象学报,

55(4): 492-498

利用黑河实验中化音站(戈壁)加强期的湍流脉动场资料对影响降水强迫对戈壁局地气候系统水、热输送的过程进行了系统分析。结论为: 降水对戈壁局地气候系统的强迫一般是通过辐射效应和土壤增湿效应两个过程对戈壁局地气候系统产生影响。降水作为强迫因子将使局地气候系统出现暂时的不平衡状态, 这种不平衡气候系统要达到新的平衡状态必须通过一个物质和能量的重新调配过程。该过程可分为4个阶段, 各阶段的感热和潜热及地表蒸发均有较大差异, 从物质和能量输送特征来看, 受降水干扰后戈壁局地气候系统达到新的平衡状态所需要的张弛时段大约为4d。在张弛时段内, 地表接收的降水约有2/3通过地表蒸发后输送到大气, 其余部分可能渗入地下。

关键词: 降水强迫

戈壁局地气候系统 非平衡状态  
水、热输送 张弛时段

Zhang Qiang, Hu Jinqiao, and Zhao Ming.

1997. Effects of rainfall forcing on the transport of water and heat in the local climate system of Gobi. *Acta Meteorologica Sinica* 55(4):492-498.

Using the data of turbulence observation from the Huayin Station in the Gobi area during the intensive observation period (IOP) of the Heihe River Field Experiment (HEIFE), the effects of rainfall forcing on the transport of water and heat in the local climate system of Gobi are analyzed. The results show the following: the local climate system becomes unbalanced due to the rainfall forcing; the unbalanced state can return to the balanced state after the rainfall through a new adjustment of substance and energy; the process of the new adjustment can be divided into four periods with the sensible heat flux, latent heat flux, and water vapor flux very different within the periods; the relaxation time of the unbalanced state is about four days; and about two-thirds of the rainfall is transported into the atmosphere by the evaporation of ground surface while the rest may permeate the ground.

Keywords: rainfall forcing, local climate system of Gobi, unbalanced state, transport of water and heat, relaxation time



柯东胜, 许时耕, 1997,

ENSO对南沙海域气候状况的影响,  
气象学报, 55 (4): 506-511

利用1961-1990年

(部分资料到1994年)南沙海域的观测资料, 对南沙海域气

候状况进行了统计分析。

结果表明: 在ENSO发生的当年, 南沙海域的海平面气压呈正距平,

Ke Dongsheng and Xu Shigeng. 1997. The effect of El Niño/Southern Oscillation (ENSO) on the climate state in Nansha. *Acta Meteorologica Sinica* 55(4):506-511.

Based on the data observed from 1961 to 1990 (some data to 1994) and statistical analysis of the effect of ENSO, the following conclusions are reached. In an ENSO year the atmospheric pressure in Nansha waters is all positive anomaly, the annual precipitation is obviously little, and the annual number of tropical cyclones is fewer. The total cloud cover

年降水量明显偏少, 并且热带气旋活动的日数一般偏少; 在历次 ENSO 过程中, 南沙海域的总云量与 SOI 的变化趋势基本一致。  
 关键词: ENSO 南沙海域 气候

anomaly in Nansha waters is basically identical with the variation trend of Southern Oscillation Index (SOI) in each ENSO.

Keywords: ENSO, Nansha waters, climate



黄嘉佑, 张镔, 1997;  
 极冰对南方涛动的影响, 气象学报, 55 (2): 200-209

Huang Jiayou and Zhang Tan. 1997. The influence of the Southern Oscillation on sea ice of the Arctic and Antarctic. Acta Meteorologica Sinica 55(2):200-209.

通过分析南、北极冰量与南方涛动序列的月、季和年尺度的变化过程线性相关关系, 发现北极冰量与南方涛动是反相关关系, 而南极冰量与南方涛动是正相关关系。南极冰量与南方涛动的关系在月和季尺度上似乎较北极与大气的关系密切些。分析发现极冰与南方涛动之间存在较复杂的非线性关系。在前期极冰的强信号寻找中发现极冰与南方涛动在月系列的相关关系上存在周期变化现象。在文中还进一步探讨了月系列存在的周期变化的共同因素的影响。

关键词: 时间尺度分析  
 非线性相关 统计动力模型模拟  
 周期模型

The paper analyzes the relationship between Arctic and Antarctic sea ice and the Southern Oscillation Index on the temporal scales of month, season, and year. There is a negative correlation between Arctic sea ice and the Southern Oscillation Index, and a positive correlation was found between Antarctic sea ice and the Southern Oscillation Index. The variation of Antarctic sea ice seems to have a more important influence on the atmosphere. Their relationship seems more nonlinear than linear. The relationship between Arctic and Antarctic sea ice in the early stage and the Southern Oscillation Index exhibits periodicity. The periodic variation and the common factors in monthly series are also discussed in this paper.

Keywords: analysis for time scale, nonlinear relationship, simulation on statistic-dynamic modeling, periodic model



周鸣盛, 张廷, 1997,  
 一次雪面降温引起的异常寒冷天气分析, 气象学报, 55(2): 219-229

Zhou Mingsheng and Zhang Ting. 1997. The diagnosis analysis for the unusual cold weather due to the temperature dropping over snow cover. Acta Meteorologica Sinica 55(2):219-229.

文章对1993年11月18日和1979年11月18日两次异常寒冷天气进行了对比分析, 揭示出内蒙古东部雪面空

The paper discusses two episodes of severe cold weather on 11/18/1993 and 11/18/1979 and reveals the formation process of cold high



气温降温形成的强冷高压。按Brunt公式计算出晴天有效辐射,与实际情况相吻合。并按照对流层中下层相似的气温直减率,得到当地新雪面空气制冷的净降温客观估计值。内蒙古东部高原雪面强冷高压的偏北气流顺坡南下在京津冀地区形成超低空急流,促使当地气温剧烈下降,出现异常低温天气。还给出强冷高压控制下,华北东部特殊地形上的中尺度下坡风的物理图象。

关键词: 雪面降温 冷高压 下坡气流 超低空急流

pressure as a result of radiative cooling over the snow surface east of the Inner Monggol Plateau. According to the Brunts effective radiation formulation and the normal lapse rate of temperature, the near-surface-layer air temperature as a result of snow cover radiative cooling was calculated. The results were very near the observational data. The cold air from the Inner Monggol Plateau moved down along the slope southward and an extra-low-level jet occurred over Beijing, Tianjin, and Hebei. So the surface temperature dropped sharply in this region. The physical mechanism for the occurrence of orographic downward wind was in the solenoid field.

Keywords: temperature dropping over snow surface, cold high pressure, orographic downward wind, extra-low-level jet



王谦谦, 钱永浦, 1997,  
太阳辐射日变化对夏季风模拟特征的影响, 气象学报, 55(3): 334-345

Wang Qianqian and Qian Yongpu. 1997.  
Effects of diurnal variation of solar radiation on the simulated properties of the summer monsoon. Acta Meteorologica Sinica 55(3):334-345.

利用 $60^{\circ}\text{S}-60^{\circ}\text{N}$ 范围内地气和海气相耦合的耦合模式系统,进行了有无太阳辐射日变化的对比试验。研究表明:太阳辐射日变化对于模拟的夏季风准平衡态平均环流形势影响不大。对平均夏季风形势的影响主要来自于海陆和地形分布。但模式中包含太阳辐射日变化后,对大气高低层季风系统的模拟强度有所改善。日变化对降水场影响较大,如无日变化,大陆降水将大大减少,而沿岸地区降水则增加,增雨区和减雨区呈波状分布。太阳辐射日变化可以促使季风气候的准平衡态较早达到。

关键词: 太阳辐射日变化 夏季风 数值模拟

Using an atmosphere-ocean coupled model system in a zonal domain between  $60^{\circ}\text{S}$  and  $60^{\circ}\text{N}$ , the comparative experiments are made with and without diurnal variation of solar radiation. The results show that the diurnal variation of the solar radiation does not have a very large influence on the mean monsoon system in the quasi-equilibrium state; the main influences may come from the land-sea and the topography distributions. But, its inclusion into the model does improve the simulations of the monsoon systems at the upper and the lower levels. The diurnal variation of the solar radiation influences the simulated precipitation pattern greatly. In the experiment without the diurnal variation of the solar radiation, the precipitation amount over the land areas is greatly reduced while it is increased over the areas along the coasts. The areas with increased precipitation and the areas with decreased precipitation are distributed in a wavelike form. The diurnal variation of the solar radiation can make the monsoon development reach the quasi-equilibrium state earlier.

Keywords: diurnal variation of solar radiation, summer monsoon, numerical simulations



陈千盛, 1997,  
城市效应对福州市气候的影响,  
气象, 23(1): 41-45

根据福州气象站1951-1993  
年的气象资料,  
分别建立了福州最热月平均气温、  
最高气温、极端最高气温和全年出  
现的最高气温  $\geq 35^{\circ}\text{C}$   
日数的变化趋势方程,  
计算了各自的倾向率,  
揭示了福州气候的变化规律。通过  
城区和郊区的气候资料对比分析,  
发现城区存在热岛、雨岛、干岛、  
浑浊岛等城市气候效应现象以及雾  
、雷暴负效应现象。并讨论了这些  
现象产生的原因。  
关键词: 城市气候 热岛效应  
负效应

**Chen Qiansheng.** 1997. The influence of  
urbanization on climate in Fuzhou City.  
Meteorological Monthly 23(1):41-45.

Based on climatic information from 1951 to  
1993, the paper discusses the air temperature  
tendency at Fuzhou City. The results show that  
there are some urban effects, such as heat  
island, rain island, dry island, and turbid island  
in Fuzhou City, and that there are also some  
negative effects of fog and thunderstorm. The  
causes of these effects are also discussed.

Keywords: urban climate, heat island effects,  
negative effects



李红梅, 刘文杰, 1997,  
景洪市城市发展对气候的影响,  
气象, 23(3): 38-41

选取景洪站与热作站自  
60年代以来的气象资料进行对比分  
析, 探讨了景洪城市发展对  
气候的影响。结果表明,  
景洪市城市热岛效应日趋明显,  
年均温、平均最高温及平均最低温  
差均有增大趋势, 而降水量、空气湿  
度、雾日数、日照时数、太阳辐射  
量等逐年减少。城市热岛效应有明  
显的季节性, 其规律是:

**Li Hongmei and Liu Wenjie.** 1997. Effect of  
development of Jinghong City on climate.  
Meteorological Monthly 23(3):38-41.

Based on the compared observations between  
Jinghong City and the rural area, the effects of  
the development of Jinghong City on climate  
are studied by analyzing long-term data (since  
1960's). The results indicate that: (1) With the  
rapid development of Jinghong City, the urban  
heat island effect is gradually obvious. (2) The  
difference of the temperature and wind speed  
between city and rural area is gradually  
increasing. (3) The rainfall, air humidity,  
number of fog days, sunshine duration, and  
solar radiation over the city attenuate  
remarkably. The urban heat island effect is more  
obvious in the dry season than in the rainy  
season, far more obvious at night than day in

干季强于湿季,干季夜间强于白天,  
雨季白天强于夜间。  
关键词: 城市发展  
局地气候 城市热岛效应

the dry season, far more obvious at day than  
night in the rainy season.

Keywords: development of city, local climate,  
urban heat island effect



许金镜, 唐文伟, 林仲平, 1997,  
副高持续偏强对福建气候的影响,  
气象, 23(1): 36-37

**Xu Jinjing, Tang Wenwei, and Lin  
Zhongping.** 1997. Effect of persistently strong  
subtropical high on Fujian climate.  
Meteorological Monthly 23(1):36-37.

针对近几年副高持续偏强这一异常  
现象,并以1951-1995年副高特征量  
和气温、降水等气象要素为基础,  
分析了副高  
持续偏强这一基本事实以及对福建  
的气温、降水、热带气  
旋等天气气候的影响。  
关键词: 副高强度指数 面积指数  
天气气候

In the study of the persistently strong  
subtropical high that existed for a few years, the  
subtropical high features, air temperature, and  
precipitation data from 1951 to 1995 are  
analyzed. Also the effects of the phenomenon  
on the weather and climate in Fujian Province  
are studied.

Keywords: subtropical high intensity index,  
area index, weather and climate



谢安, 刘霞 叶谦, 1997,  
赤道漩涡与南海夏季风爆发,  
气象学报, 55(5): 611-619

**Xie An, Liu Xia, and Ye Qian.** 1997.  
Equatorial vortex and the onset of the summer  
monsoon over the South China Sea. Acta  
Meteorologica Sinica 55(5):611-619.

利用1979-1995年的850hPa  
风场和卫星资料OLR,讨论了  
南海夏季风爆发和推进的特征,  
着重分析了赤道漩涡与夏季风  
爆发的可能联系。结果表明,  
南海夏季风的爆发落后于  
其两侧的陆地和岛屿,但在东西方向  
上几乎是同时的,具有某种驻波  
的特性。大多数年份的4、5月间,  
在105°E附近有赤道漩涡形成,引  
导西南季风和赤道西风进入南海南  
部,为南海夏季风

Using National Meteorological Center (NMC)  
wind data and outgoing longwave radiation (OLR)  
data from the National Oceanic and Atmospheric  
Administration (NOAA) from 1979-1995, the  
characteristics of summer monsoon onset in the  
South China Sea (SCS) are discussed. The results  
show that the onset of the summer monsoon  
occurs later in SCS region than in peripheral  
island areas. But the onset of the summer  
monsoon in the eastern part of SCS is almost at  
the same time as that in the western part of SCS,  
which has a somewhat standing wave feature. In  
most years, an equatorial vortex forms near 105°E  
in April or May and the vortex leads the equatorial  
westerly in its upper reaches and the westerly in  
the Southern Hemisphere to the southern part of

爆发创造有利条件。在漩涡不活跃的年份,南海夏季风爆发偏晚,两者之间有某种联系。4月中旬漩涡的形成和105°E越赤道气流的初步建立有一定的联系,而南海夏季风与105°E的气流更密切。70-90°E附近的赤道西风对南海季风爆发也会产生重要影响。

关键词: 南海夏季风爆发  
赤道涡旋 东亚涡旋  
105°E越赤道气流

SCS. This creates a favorable condition for onset of the SCS summer monsoon. In the years when the equatorial vortex is inactive, the onset of the summer monsoon in the SCS is late. There is some relationship between the equatorial vortex and the onset date of SCS summer monsoon. In middle April, the forming of the vortex and the preliminary building of cross-equatorial flows at 105°E is simultaneous. In May, these cross-equatorial flows enhance gradually and the activity of the SCS summer monsoon may be closely associated with these flows.

Keywords: summer monsoon onset in the South China Sea, equatorial vortex, East Asian vortex, cross-equatorial flows at 105°E



张爱华, 吴恒强, 覃武,  
蒋伯仁, 1997,

南半球大气环流对华南前汛期降雨  
影响初探, 气象, 23 (8):10-15

**Zhang Aihua, Wu Hengqiang, Tan Wu, and Jiang Boren.** 1997. The preliminary exploration for the influence of general circulation over the Southern Hemisphere on precipitation over South China during pre-flood season. Meteorological Monthly 23(8):10-15.

本文利用南半球海平面气压场格点资料,通过差值场和相关分析,研究了南半球大气环流对华南前汛期降雨的影响。结论表明:无论是同期还是前期,华南前汛期多雨年和少雨年所对应的南半球大气环流系统基本呈反相,两者之间存在密切关系。就澳大利亚高压、马斯克林高压、南美对流活跃区等对华南前汛期降雨影响的可能机理进行了初步分析。

关键词: 南半球 大气环流  
华南前汛期降雨 澳大利亚高压  
马斯克林高压

Using gridded field data of sea level pressure over the Southern Hemisphere, through the difference value fields and correlation analysis, the influence of the general circulation of the atmosphere over the Southern Hemisphere on precipitation over South China during the pre-flood season is analyzed. The result shows that: The general circulations of the atmospheric system over the Southern Hemisphere are basically out-of-phase for drought and waterlogging years, in the same term or earlier stage. The influence of the Australia anticyclone, the Mascarene anticyclone, and the convective active region of South America is preliminarily analyzed.

Keywords: Southern Hemisphere, general circulation of the atmosphere, precipitation over South China during pre-flood season, Australia anticyclone, Mascarene anticyclone

张苏平, 朱平盛, 胡桂芳, 1997,  
山东夏季降水与北太平洋SST和大  
气环流的关系, 气象, 23 (4):3-8

通过计算表明赤道东太平洋和北太平洋流区海温与山东夏季降水相关性好, 在此基础上讨论了山东夏季旱涝年同期、前期SST异常的特征及其与大气环流的相互关系, 发现同期SST异常显著, 前期赤道东太平洋SST负异常与500hPa大气环流负WP遥相关型关系密切。利用2-4月高相关区SSTA做当年夏季降水趋势预测的试验和利用赤道东太平洋区3月、北太平洋区7月海温做长期夏季降水预测的试验表明SST可以对山东夏季的旱涝预测提供非常有价值的参考。

关键词: 夏季降水 北太平洋海温  
大气环流

Zhang Suping, Zhu Pingsheng, and Hu Guifang. 1997. Relationship among summer rainfall in Shandong and North Pacific sea surface temperature (SST) and atmospheric circulation. Meteorological Monthly 23(4):3-8.

Calculation shows a good correlation between summer rainfall in Shandong Province and sea surface temperature (SST) in the equatorial eastern Pacific (EEP) and in the North Pacific Current (NPC) areas. On the basis of the correlative analysis, the contemporary and antecedent SST anomaly features of rainy and dry summers and the relationship with atmospheric circulation is discussed. The contemporary SST departure is noted, and the negative SST anomaly in the EEP area prior to those summers is closely related to a negative West Pacific pattern, and the SST anomaly in NPC area is likely to be modulated by the anomaly of atmospheric circulation. The experiments using SST of February-April in highly correlative areas and SSTA of March in the EEP area and of July in the NPC area show that SST is of great reference value for long-term forecast of summer rainfall in Shandong Province.

Keywords: summer rainfall, North Pacific sea surface temperature, atmospheric circulation



张新时, 周广胜, 高琼, 倪健, 唐海萍,  
1997,  
中国全球变化与陆地生态系统关系  
研究, 地学前缘, 4(1-2): 137-144

文章对近年来我国在全球变化与生态系统关系研究方面的新观点、新认识及新进展作了评述。并指出我国进行全球变化与陆地生态系统关系研究时应注重以陆地样带研究为基础的各科学计划间的交叉以及应加强研究的领域。

关键词: 全球变化 生态生理试验  
模拟 荒漠化

Zhang Xinshi, Zhou Guangsheng, Gao Qiong, Ni Jian, and Tang Haiping. 1997. Study on global change and terrestrial ecosystems in China. Earth Science Frontiers 4(1-2):137-144.

This paper comments on the new understandings, new advances, and new points of view in recent research on the relationship between global change and the terrestrial ecosystem in China. It points out the need for future interplant study and presents some important suggestions.

Keywords: global change, ecophysiological experiment, modeling, desertification

张丕远, 葛全胜, 吕明, 陈晓蓉, 1997, 全球环境变化中的人文因素, 地学前缘, 4(1-2): 195-200

全球环境变化可能成为下一个世纪最为紧迫的国际问题。这是因为人类活动的的能力已经大到足够影响到全球的环境, 而全球环境变化又给人类带来重大影响。文章探讨了人文因素在全球环境变化中所扮演的角色。由于人类在对待环境要素变化时, 有选择其行为的自由, 所以人文因素没有像大气、海洋那样, 称为全球环境变化的子系统。这一点在建模中应给以充分考虑。文章讨论了各类系统对气候变化适应的脆弱性定义, 并以海平面、农业、林业、渔业和人类健康为例, 观测它们如何受到全球气候变暖的影响。

关键词: 全球环境变化 人文因素 影响

朱震达, 1997, 全球变化与荒漠化, 地学前缘, 4(1-2): 213-219

分析了干旱、半干旱地区沙质荒漠化的成因过程、发展趋势。指出干旱是荒漠化形成的原因, 而不合理的人类活动则加剧了它的发展。在中国北方荒漠化土地的成因类型中, 过度放牧占30.1%, 过度开垦占26.9%, 过度樵采占32.7%, 水资源利用不当占9.6%, 而由于在工交建设中不重视环境保护而造成的占0.7%。由此可知,

Zhang Peiyuan, Ge Quansheng, Lu Ming, and Chen Xiaorong. 1997. Human dimension in the global environmental change. Earth Science Frontiers 4(1-2):195-200.

Global change may be one of the urgent international issues in the coming century. Because of humankind's unprecedented importance as an agent of global change and the potential for future environmental changes to alter societal arrangements, no one would argue that there are no connections between human activities and changes in global climate. What connections should exist between natural science research on change to the earth system and social investigations of the humandimensions of global change is explained in brief. Generally speaking, the human dimension is one of the subsystems in the global change, however, it has not been given the name of subsystem, but dimension. This is based on its special characteristics. Mankind can select activities that either cope with the environmental change or not. We have to select a more flexible model to deal with such characteristics. The vulnerability of a system's response to climate change is discussed as are examples of the impacts of climate change on vulnerable systems, such as sea level, agriculture, forestry, fishery, and human health are explained.

Keywords: global environmental change, human dimension, impacts



Zhu Zhengda. 1997. Global changes and desertification. Earth Science Frontiers 4(1-2):213-219.

The origin and trend of sandy desertification in the arid and semi-arid regions was analyzed. It is pointed out that although sandy desertification is caused by drought, the irrational human activities in recent times are responsible for the increased development of desertification. In North China, 30.1% of sandy desertification was caused by overgrazing, 26.9% by over-reclamation, 32.7% by excess woodcutting, 9.6% by misuse of water resources, and 0.7% by industrial mining and communication activities. Using land rationally and taking protective measures is the most

护而造成的占0.7%。由此可知,合理利用土地以及采用相应的防治措施是防治荒漠化的重要途径。  
 关键词: 荒漠化 沙质荒漠化 现状趋势

and taking protective measures is the most important way to defend against desertification.

Keywords: desertification, sand desertification, status, trend



刘国东, 丁晶, 1997,  
 应用BP网络研究气候变化对雅砻江  
 和嘉陵江流域水资源环境的影响,  
 中国环境科学, 17(5): 414-417

**Liu Guodong and Ding Jing.** 1997. Applying the backpropagation (BP) neural networks to study effects on water resources in Yalongjiang and Jialingjiang River catchments due to variations of climate factors. China Environmental Science 17(5):414-417.

依据1960-1990年(雅砻江)和1960-1987年的实测资料,  
 采用人工神经网络模型建立了雅砻江和嘉陵江流域年平均气温、年降水量与年径流之间的BP网络模型。定量研究并模拟了气温和降水变化对雅砻江和嘉陵江流域水资源环境的影响。结果表明气温增高和降水量减少将造成水资源量的大量减少,对生态环境造成威胁。

In order to investigate the effect of climate on the water resource environment, two backpropagation (BP) neural networks, in which the atmospheric temperature (T) and precipitation (P) are input neurons and the run off (Q) is an output neuron, are designed for Yalongjiang and Jialingjiang River catchments using information of Yalongjiang and Jialingjiang River catchments from 1960 to 1990. The results indicate that water resources will decrease greatly in these two river catchments when atmospheric temperature rises and precipitation decreases.

关键词: 气候影响 BP神经网络  
 水资源环境

Keywords: climate influence, BP neural network, water resource environment



张宏, 樊自立, 1997,  
 气候变暖对渭干河三角洲农业的影响,  
 干旱区研究, 14(3): 65-68

**Zhang Hong and Fan Zili.** 1997. The influences of climate warming on active-accumulated-temperature (AAT) and agricultural-planting-system (APS) in Weiganhe Delta. Arid Zone Research 14(3):65-68.

研究了在未来气候变暖条件下渭干河三角洲 $\geq 0^{\circ}\text{C}$ 和 $\geq 10^{\circ}\text{C}$ 两种活动积温及其持续日数的变化规律。结果表明,随着气温的升高,活动积温及持续日数也相应增加。在此基础上,讨论了农业种植制度随积温的变化而进行调整的可能性。

The two kinds of active-accumulated-temperature (AAT), titled  $\geq 0^{\circ}\text{C}$  and  $\geq 10^{\circ}\text{C}$  and sustainable time were calculated under two different climate-warming scenarios in the Weiganhe Delta. The two AATs will enhance to some extent the annual temperature increase. Meanwhile, the possibility of change of agricultural planting system (APS) in the Weiganhe Delta to matching the changed AATs is discussed.

关键词: 气候变暖 活动积温  
农业种植制度 渭干河三角洲

Keywords: climate warming, active-accumulated-temperature (AAT), agricultural-planting-system (APS), Weiganhe Delta



马淑梅,  
李宝英, 1997, 气象因素对大豆灰斑病发生的影响,  
中国农业气象, 18(5): 7-8

根据多年的观测和试验, 发现影响大豆灰斑病发生程度的主要气象因子是湿度和雨量。其农业气象指标: 重发生年为7月中旬-

8月中旬, 降水量均超过300mm, 相对湿度在80%以上; 轻发生年为7月中旬-

8月中旬, 降水量在150mm以下, 相对湿度在75%

以下; 中度发生年的降水量和相对湿度介于上述两者之间。

关键词: 雨量 相对湿度  
大豆灰斑病 发生影响

Ma Shumei and Li Baoying. 1997. Impacts of meteorological factors on the occurrence of gray speck of soybean. China Agricultural Meteorology 18(5):7-8.

Based on observation and experiments in recent years, the impacts of meteorological factors on the occurrence of gray speck of soybean were discovered. The results show that the important climatic factors that caused the gray speck of soybean are humidity and precipitation. The agricultural climate index shows that years with the precipitation and the relative humidity more than 300 mm and 80% respectively in the period from the middle of July to the middle of August are the serious years, whereas years with precipitation and humidity less than 150 mm and 75% are the slight years. Years with the humidity and precipitation between the stated ranges are the moderate years for gray speck of soybean.

Keywords: precipitation, relative humidity, gray speck of soybean, impact on



郑循华, 王明星, 王跃思, 沈壬兴,  
张, 文 龚晏邦, 1997,  
温度对农田 $N_2O$ 产生与排放的影响,  
环境科学, 18(5): 1-5

Zheng Xunhua, Wang Mingxing, Wang Yuesi, Shen Renxing, Zhang Wen, and Gong Yanbang. 1997. Impacts of the temperature on the generation and emission of  $N_2O$  in farmland. Environmental Science 18(5):1-5.

以太湖地区稻麦轮作生态系统为研究对象, 采用基于箱法-气相色谱法的自动连续观测系统, 对 $N_2O$ 的排放和温度进行了同步自动连续观测, 并在实验室中进行了一系列模拟实验, 研究了 $N_2O$ 产生与排放的温室效应。实验结果表明, 在土壤湿度适宜的情况下,

The synchronous, automatic, and continuous observations on  $N_2O$  emission from rice-wheat rotation systems and temperature in the Taihu Lake Region of Southeast China were conducted using box-gas chromatographic method. A series of simulated tests were carried out in order to study the greenhouse effects caused by  $N_2O$  generation and emission. The results showed that under the condition of suitable soil humidity, the dependence of  $N_2O$  emission on temperature can be prescribed by



$\text{N}_2\text{O}$  排放通量对温度依赖性  
可用指数函数  $F = Ae^{at}$  来表示;  
轮作周期内显著  $\text{N}_2\text{O}$   
排放发生频率随温度的变化呈正态  
分布, 67% 的排放量都集中在  $15^\circ\text{C}$ -  
 $25^\circ\text{C}$  之间; 在旱地阶段,  
温度是影响  $\text{N}_2\text{O}$   
排放季节变化的关键因子,  
在水田阶段则不是这样; 水田和旱  
地  $\text{N}_2\text{O}$  排放具有相同  
的规律性及日变化形式。  
关键词:  $\text{N}_2\text{O}$  排放 温度 排放通量  
稻麦轮作系统 农田 太湖地区

exponential function  $F = Ae^{at}$ . In the rotation of  
period, it is evident that the frequency of  $\text{N}_2\text{O}$   
emission occurred in a normal distribution  
corresponding to the temperature variations, and  
that 67% of emission flux concentrated on the  
range from  $15^\circ\text{C}$  to  $25^\circ\text{C}$ . In the dry land,  
temperature is the major factor that influenced  
the seasonal variations of  $\text{N}_2\text{O}$  emission, but it  
was different in paddy fields. The  $\text{N}_2\text{O}$  emission  
has the same regulation of diurnal variation both  
in dry land and paddy field.

Keywords:  $\text{N}_2\text{O}$  emission, temperature,  
emission flux, rice-wheat rotation system,  
farmland, Taihu Lake area



武炳义, 高登义, 黄荣辉, 1997,  
冬季格陵兰、喀拉海和巴伦支海海  
冰年际变化与 ENSO 事件的关系,  
科学通报, 42(18): 1979-1981

讨论了冬季格陵兰、喀拉海和巴伦  
支海海冰年际变化与 ENSO 事件的  
关系,  
表明该海域海冰面积异常可以引起  
北半球大气环流异常响应,  
尤其当海冰面积变化超前大气变化  
3 年时,  
可诱发大气高度场产生 PNA 型异常  
。 ENSO 事件都发生在海冰面积变化  
速度为极值点的时机。  
关键词: 年际变化 海冰 ENSO  
变化速度

Wu Bingyi, Gao Dengyi, and Huang Ronghui.  
1997. El Niño/Southern Oscillation (ENSO)  
events and interannual variations of winter sea-  
ice in the Greenland, Kara, and Barents Seas.  
Chinese Science Bulletin 42(18):1979-1981.

The paper discusses the relationship between El  
Niño/Southern Oscillation (ENSO) events and  
interannual variations of winter sea-ice in the  
Greenland, Kara, and Barents Seas. The results  
show that the extent anomaly of winter sea-ice  
in those sea regions would result in a Northern  
Hemispheric atmospheric circulation anomaly,  
especially when atmospheric circulation lags the  
sea-ice 3 years, and that the sea-ice extent  
variations would lead to a Pacific-North  
American (PNA) pattern anomaly. ENSO events  
happened when the variation velocities of the  
sea-ice extent reached an extreme value.

Keywords: interannual variation, sea-ice,  
ENSO, variation velocity

汤懋苍,

董文杰, 1997, 青藏高原的抬升和夷平过程对气候与环境的影响, 高原气候, 16(1): 23-29

系统地讨论了高原隆起前的早第三纪至现代青藏高原的7次抬升过程对气候和环境的影响, 应用气象学理论分析了当时气候形成的原因。认为: (1) 高原隆起前的干热气候是由于隆起前全球地势平坦, 导致大气热机效率较低之故; (2) 渐新世初高原的水平尺度达到了斜压大气地转适应的临界尺度, 大气环流从南北两极“两涡对峙”突变成地球三极的“三涡鼎立”, 气候发生突变; (3) 分分析了2.5 Ma时高原抬升到2000 m这一临界高度后大气环流的一系列相应变化; (4) 计算、比较了最大冰期地气系统能力平衡与现代的差异, 并由此分析了当时的气候状况。

关键词: 高原隆起 夷平作用 地质气候突变 最大冰期 能量平衡

张琼, 钱正安,

陈敏连, 1997, 关于夏季南亚高压的进一步研究——与我国西北地区降水关系的统计分析, 高原气象, 16(1): 52-62

利用1970—1985年7—8月逐日历史天气图及降雨量等资料, 统计了南亚高压脊线和中心活动的基本特征; 划分了逐日东、西部型及带状型南亚高压及持续的东、西部型南

Tang Maocang and Dong Wenjie. 1997.

Influence of seven Tibetan Plateau raising processes on climate and environment. Plateau Meteorology 16(1):23-29.

In this paper, the influences of seven Tibetan Plateau raising processes on climate and environment are discussed. The cause of climate formation is analyzed using meteorological theory. The main conclusions are as follow: (1) the cause of the hot-dry climate before the elevation of the plateau is that the efficiency of the atmospheric heat engine is lower than after the elevation because of the flatter global landform. (2) At the beginning of Oligocene Epoch, the horizontal scale of the plateau reached the critical scale of geostrophic adjustment of the baroclinic atmosphere, following which atmospheric general circulation changed from “two vortexes” to “three vortexes.” (3) A series of variability in atmospheric general circulation corresponding to the plateau’s reaching 2000 m, at 2.5 Ma BP is analyzed. (4) The energy balance of the earth-atmospheres system at the Great Ice Age is estimated, and the difference between the energy balance at the Great Ice Age and at present is contrasted.

Keywords: uplift of the Plateau, planation, abrupt change of geological climate, maximum glacial age, energy balance



Zhang Qiong, Qian Zhengang, and Chen

Minlian. 1997. The further study about the South Asia High in summer: Statistical analyses of the relationship between the South Asia High and precipitation distribution over Northwest China. Plateau Meteorology 16(1):52-62.

In this paper, using daily historical synoptic map data and precipitation map of July and August during the period from 1970 to 1985, the basic activity characteristics of the South Asia High (SAH) and the relationship between the SAH and precipitation over Northwest China are analyzed. The results show: (1) The 100 hPa SAH in summer stays mainly over the

亚高压过程,还区分了西北区东、西部的多雨、少雨日。结果表明:南亚高压脊线和中心位置(特别是持续的东、西部型南亚高压过程)与东、西部多雨和少雨过程有密切关系。

关键词: 100hPa南亚高压  
西北地区降水  
东、西部型SAH过程

Qinghai-Xizang Plateau and its neighborhood, which suggests impacts of the Plateau on the SAH. (2) When the monthly mean SAH ridgeline is located somewhat south, the precipitation over Northwest China will increase. (3) During the continuous processes of eastern pattern of the SAH, it will be rainy in the eastern part of Northwest China but dry in the western part of Northwest China. (4) We also sum up the distribution of rainy area of eastern pattern of the SAH.

Keywords: 100 hPa SAH, precipitation of Northwest China, eastern- and western-pattern SAH processes



刘子臣, 梁生俊, 张建宏, 1997, 登陆台风对黄土高原东部暴雨的影响, 高原气象, 16(4): 402-409

对80年代以来3次登陆台风低压外围影响黄土高原的大暴雨作了气候分析,对9608号台风进行了天气动力诊断分析。结果表明:登陆台风低压外围产生大暴雨的主要机制是台风外围低空偏东急流与西风带低值系统的共同作用以及地面冷锋的动力抬升作用。这一结果可为此类暴雨预报提供理论依据。

关键词: 登陆台风低压外围暴雨  
低空东风急流 西风带低值系统

Liu Zichen, Liang Shengjun, and Zhang Jianhong. 1997. The effect of making land typhoon depression on heavy rain in eastern part of the Loess Plateau. Plateau Meteorology 16(4):402-409.

This paper reports a climatic analysis of 3 cases of heavy rain on land typhoon depression in the Loess Plateau since the 1980s and a diagnostic analysis of torrential rain around 9608 typhoon depressions. The results show that the main mechanism of heavy rain formation is the influence of the easterly jet around a typhoon depression, a low-pressure system in the westerly belt, and the lifting of the surface cold front. The result provides the theoretical basis for forecasting this kind of torrential rain.

Keywords: heavy rain around typhoon depression, low-level easterly jet, low-pressure system in westerly belt



白虎志, 张焕儒, 张存杰, 1997, 兰州城市化发展对局地气候的影响, 高原气象, 16(4): 410-416

研究了兰州气候变化特征及其城市化发展对局地气候的影响,发现80

Bai Huzhi, Zhang Huanru, and Zhang Cunjie. 1997. The influences of Lanzhou urban development on local climate. Plateau Meteorology. 16(4):410-416.

Features of the climatic variation of Lanzhou and the influences of urbanization development on the local climate of city and suburbs are

年代之后,兰州年平均温度相对于60—70年代平均气温的上升幅度是全省气温上升幅度的近4倍,其它要素的年、季变化均表现出明显的特征。兰州城市与郊区年、季平均气温差、平均最高和最低气温差有逐渐增大的趋势;年、季降水日数差、日照时数差有明显的减少趋势。

关键词: 城市化发展 气候影响  
气温

studied. The results show that the rise of mean temperature in Lanzhou since the 1980s is about four times that of the Gansu province in the 1960s and 1970s. The interannual and seasonal variation characteristics of other factors are clear. The differences of the annual and seasonal mean temperature and the mean maximum and minimum temperature between Lanzhou City and its suburbs are gradually increasing. The annual and seasonal differences of rain day and sunshine duration are decreasing.

Keywords: urbanization development, climatic effect, air temperature



江灏, 王可丽,

吴国雄, 1997, 青藏高原地区地表温度及其取值对大气长波辐射冷却的影响, 高原气象, 16(3): 250-257

Jiang Hao, Wang Keli, and Wu Guoxiong.

1997. Effects of surface temperature on atmospheric longwave radiative cooling over the Qinghai-Xizang Plateau. Plateau Meteorology 16(3):250-257.

针对辐射传输模式在青藏高原地区的应用问题, 使用Liou-Ou一维辐射传输模式及1982年8月—1983年7月青藏高原热源观测实验期间青藏高原地面、高空与卫星观测资料, 在高原辐射传输模式中区分了下垫面温度与地表空气温度的作用, 并利用卫星观测资料对模式改进后的实际效果进行了验证; 分析了地表温度的日变化和季节变化幅度, 得到了下垫面温度的简单参数化方法。

关键词: 青藏高原 地表温度  
辐射传输

In order to achieve the goal of using the atmospheric radiative transfer model over the Qinghai-Xizang Plateau region, surface temperature in the model and effects of that on the calculation results of atmospheric longwave radiative cooling are analyzed with the Liou-Ou one-dimension radiative transfer model based on the data set of surface, radiosonde, and satellite observation over the Qinghai-Xizang Plateau during the period from August 1982 to July 1983. The effects of both underlying surface temperature ( $T_g$ ) and near-surface air temperature ( $T_a$ ) are distinguished in the radiative transfer model, and the effectiveness is verified using satellite observation data. The diurnal cycle and seasonal cycle of  $T_g$  and  $T_a$  are analyzed, and a simple method to calculate the  $T_g$  from the  $T_a$  is presented.

Keywords: The Qinghai-Xizang Plateau, surface temperature, radiative transfer

戴晓苏, 1997, 气候变化对我国小麦地理分布的潜在影响, 应用气象学报, 8(1): 19-25

根据GCM模拟结果, 分析了CO<sub>2</sub>增加对我国小麦生产地理分布的潜在影响。结果表明: 在CO<sub>2</sub>加倍的气候条件下, 我国小麦生产区将进一步向北和向西扩展, 小麦栽培特点和品种类型也有较大变化, 气候增暖可能对东北地区产生有利影响。但在中部和南部则可能产生高温应力。小麦生长期平均温度的升高, 特别是收获前的高温会增加对更早熟、更耐热品种的需求。

关键词: 气候变化 二氧化碳  
气候影响 农作物地理分布

Dai Xiaosu. 1997. Potential effects of climatic variation on geographical distribution of wheat in China. Quarterly Journal of Applied Meteorology 8(1):19-25.

The potential CO<sub>2</sub>-induced impacts on the geographical shift of wheat growth zones in China are analyzed based on General Circulation Model (GCM) outputs. The results show that the wheat growth regions may move northward and westward under conditions of a doubled CO<sub>2</sub> climate. The wheat cultivation features and variety types may also experience significant changes. Climatic warming would have a positive influence in Northeast China, but high-temperature stress may be produced in some regions of central and southern China. Higher mean air temperatures during wheat growth, particularly during the reproductive stages, may increase the need for earlier maturing and more heat-tolerant cultivates.

Keywords: climate variation, carbon dioxide, climate impact, crop geographical distribution



庄丽, 1997, 北印度洋气候对冬夏航线选择的影响, 应用气象学报, 8(4): 445-451

本文结合中央气象台海洋气象导航中心近10年来的实船导航业务, 分析了北印度洋气候对冬、夏季航线选择的影响因素, 指出应结合北印度洋的冬、夏季气候变化及地形特点选择不同的气象航线。该文为在实际工作中根据不同的季节及船型情况选择不同的航线、规避大风和巨浪出现频率高的区域, 以及保持良好的航行条件提供了依据。

关键词: 北印度洋 气候变化  
航线选择

Zhuang Li. 1997. Impact of climate over the North Indian Ocean on choice of shipping routes in winter and summer. Quarterly Journal of Applied Meteorology 8(4):445-451.

The impact factors of climate over the North Indian Ocean on the choice of shipping routes in winter and summer are summarized on the basis of the operation in the last 10 years of the Center of Ocean-Meteorological Route in the Central Meteorological Observatory. Analysis shows that different Meteorological routes should be chosen by combining winter and summer climate variation over the North Indian Ocean and characteristics of ocean orography. This work supplies a valuable basis for choosing different routes to avoid regions with high-frequency strong wind and huge wave according to the conditions of different seasons and ships.

Keywords: North Indian Ocean, climate change, route choice

翟盘茂, 周琴芳, 1997,

北半球雪盖变化与我国夏季降水,  
应用气象学报, 8(2): 230-235

利用1973-1995

年北半球卫星雪盖资料, 研究了北半球、欧亚和北美3个地区雪盖的气候特征及其变化, 指出在70年代是雪盖变化明显扩张时期, 1978年达到最高值。80年代以来雪盖逐步收缩, 1986年以后持续低于正常。对东亚雪盖与我国夏季降水相关分析的结果表明, 东亚冬季雪盖与长江中下游至江南地区夏季降水量呈显著反相关; 春季雪盖对中国夏季降水的影响与冬季有所不同, 显著的反相关区出现在45°N以北的东北和西北地区。

关键词: 雪盖变化 夏季降水 相关

**Zhai Panmao and Zhou Qinfang.** 1997. The change of Northern Hemisphere snow cover and its impact on summer rainfalls in China. Quarterly Journal of Applied Meteorology 8(2):230-235.

Based on the analysis Northern Hemispheric snow cover data from 1973 to 1995, climatological characteristics and changes of snow cover extent over the Northern Hemisphere, Eurasia, and North America are studied. It is found that the 1970s are a period of snow cover expansion with the maximum in 1978. After the 1980s, snow cover decreased significantly. Correlation analysis shows that East Asia winter snow cover is negatively correlated to summer precipitation in the areas from the mid-lower reaches of the Yangtze River to south of it. Spring snow cover is significantly correlated with rainfalls in northern Xinjiang and northern Northeast China. Significant reverse correlations were found between East Asia winter snow cover and the Meiyu duration when El Niño/Southern Oscillation (ENSO) years are excluded.

Keywords: change of snow cover, summer precipitation, correlation



朱平盛, 张苏平, 1997,

华北夏季旱涝的前期环流异常及其与北太平洋海温的关系,  
应用气象学报, 8(4): 437-444

分析了华北地区夏季旱涝的前期春季大气环流和北太平洋海温异常(SSTA)分布特征, 探讨了SSTA与异常环流的关系, 并用OSU-AGCM进行黑潮地区热源异常强迫的数值试验。结果表明, 当春季北极低涡明显减弱, 欧亚大陆中高纬度纬向环流加强, 西太平洋副高位置偏北偏西, 且存在负PNA型异常环流时, 华北地区夏季多雨涝; 反

**Zhu Pingsheng and Zhang Suping.** 1997.

Atmospheric circulation anomaly prior to drought/flood of summer in North China and its relationship to North Pacific sea surface temperature (SST). Quarterly Journal of Applied Meteorology 8(4):437-444.

The atmospheric circulation anomaly and the North Pacific sea surface temperature anomaly (SSTA) in the spring prior to droughts/floods of summer in North China are analyzed, and the relationships between SSTA and atmospheric circulation anomaly are discussed. Then numerical simulation by heat source anomaly in the Kuroshio current area is made using the Oregon State University (OSU) atmospheric general circulation model (AGCM). The results show that rainy summers in North China would occur if Arctic low vortices weaken significantly and zonal circulation strengthens

之则少雨干旱。此时, 西北太平洋和赤道东太平洋SST分布分别存较大的正、负异常, 它们与春季环流异常密切相关, 正的SSTA是造成华北夏涝年的前期春季异常环流形势的重要因素。

关键词: 夏季旱涝 异常环流

副热带高压 海温异常

middle-high latitudes in Eurasia, the West Pacific subtropical high lies northerly and westerly, and a remarkable negative Pacific North American (PNA) pattern exists in spring. Otherwise, there would be dry summers in North China. At the same period, positive and negative SST departures exist in the Western North Pacific and in the equatorial east Pacific respectively, which are closely related to atmospheric circulation anomalies in spring. Positive SSTA in the Kuroshio current area is an important factor for the anomalous atmospheric circulation pattern prior to flood of summer in North China.

Keywords: drought/flood of summer, anomalous atmospheric circulation, subtropical high, sea-surface temperature anomaly (SSTA)



王兴荣, 时珍玲,

严学峰等, 1997, 副热带高压活动与日月运行的关系, 热带气象学报, 13(1): 92-96

Wang Xingrong, Shi Zhenling, Yan Xuefeng et al. 1997. Relationship between the action of subtropical high and the movement of the sun and the moon. Journal of Tropical Meteorology 13(1):92-96.

本文依据公开发表的资料, 系统地研究了副热带高压活动与日月运行的关系。证实了各类副高活动均与日月运行的某种周期活动有关, 主要表现形式为周期性泊松联系和与天文奇异点同步效应两种, 并且指出, 副高活动类型不同, 则所对应的联系对象和联系方式也不同。

关键词: 副高活动 日月运行

周期性泊松联系

天文奇异同步效应

In this paper, based on published data, the relationship between the action of a subtropical high and the movement of the sun and moon is systematically studied. It shows that all types of action of subtropical highs are related to various periodical actions of the sun and the moon and that the forms of relation reveal both a Poisson periodicity and a synchronous tendency to astronomical singularities. The paper also points out that if the types of subtropical high are distinct, the related periodical action of the movement of the sun and the moon and forms of relation are distinct.

Keywords: action of subtropical high, movement of the sun and the moon, periodicity Poisson relation, synchronous tendency to astronomical singularities

邹力, 倪允琪, 1997,

ENSO对亚洲夏季风异常和我国夏季降水的影响, 热带气象学报, 13(4): 306-314

首先对ENSO过程中亚洲夏季风环流的变化进行了诊断分析, 结果表明在El Nino事件和La Nina事件中夏季风系统各成员均发生不同程度的变化, 甚至出现相反的变异特征。其次, 对我国东部地区夏季降水进行了EOF分析, 并在此基础上分析了赤道太平洋SSTA对我国东部地区夏季降水影响的程度和区域, 该影响与ENSO循环的发展阶段密切相关, 且在长江中下游地区和华南地区最为显著。

关键词: ENSO 亚洲夏季风  
合成分析

**Zou Li and Ni Yunqi.** 1997. Impact of El Niño/Southern Oscillation (ENSO) on the summer monsoon over Asia and the summer rainfall in China. *Journal of Tropical Meteorology* 13(4):306-314.

In this paper, the variability of the Asia summer monsoon circulation during the El Niño/Southern Oscillation (ENSO) period is diagnostically analyzed. Evidence suggests that every member of the Asia summer monsoon system change in varying degrees, even, oppositely, during El Niño and La Niña events. Then, on the basis of the summer rainfall in east China analyzed by using empirical orthogonal function (EOF), both the region and the extent of the impact of the equatorial Pacific sea surface temperature anomaly (SSTA) on the summer rainfall in East China are analyzed. The impact is related closely with the development phase of ENSO cycle, being most notable in the middle-lower reaches of Yangtze River and South China.

Keywords: ENSO, Asian summer monsoon, composite analysis



于淑秋, 林学椿, 1997,

北太平洋海温的气候跃变及其对中国汛期降水的影响, 热带气象学报, 13(3): 265-275

应用滑动T检验方法对北太平洋海温10年际的气候跃变进行了研究, 指出在70年代末至80年代初确实存在着一次明显的气候跃变, 而跃变前后北太平洋海温结构、厄尔尼诺事件的发展过程都明显不同, 进而讨论了北太平洋海温跃变前后对我国6—8月汛期降水量的影响, 指出海温跃变前我国汛期降水量在东北地区偏少、华北偏多; 长江流域偏少、华南偏多。而跃变后相反。

关键词: 气候跃变 海温 汛期降水

**Yu Shuqiu and Lin Xuechun.** 1997. Climatic jump of North Pacific sea surface temperature (SST) and its effect on precipitation of floods season in China. *Journal of Tropical Meteorology* 13(3):265-275.

This paper presents a study of the annual climatological jump of sea surface temperature (SST) in the northern Pacific by means of a moving T test. An obvious climatic jump is indicated in the late 1970s through the early 1980s, and there are significant differences before and after the jump in terms of its SST structure and the evolutionary processes of an El Niño event. The study of the effect of the jump on rainfall in June-August floods season in China concludes that the seasonal precipitation is less (more) than usual in the northeast of China and Yangtze River Basin (North China and South China) before the jump and vice versa.

Keywords: climatic jump, SST, rainfall in floods season



胡增臻,

黄荣辉, 1997, 冬季热带西太平洋对流活动异常的年际变化及其对北太平洋风暴轴的影响. 大气科学, 21 (5): 513-522

通过诊断分析表明, 80年代菲律宾周围的对流活动2—4年周期振荡比较明显; 北太平洋风暴轴中心有线性增强、偏北、偏东的趋势; 在2—4年时间尺度上, 菲律宾周围对流活动的变化与北太平洋风暴轴的变化有密切联系: 当菲律宾周围活动强(弱)时, 北太平洋风暴中心偏强(弱)、偏东(西)、偏北(南)。产生这种联系的物理机制是, 当菲律宾对流活动强(弱)时, 在东亚—北太平洋—北美地区产生一个距平波列(ANA), 位于美国西海岸的正(负)距平及其北侧的负(正)距平, 使气压梯度增大(减小), 北太平洋急流和风暴轴中心强度增强(减弱)、北抬(南退)、东伸(西退)。

关键词: 菲律宾 对流活动

北太平洋风暴轴

东亚—北太平洋—北美遥相关型

2—4年周期振荡

蒋全荣, 郑定英,

余志豪, 1997, 副热带高压季节性移动与海温场的联系, 大气科学, 21(2): 199-204

本文通过EOF分解, 分析讨论了西太平洋副热带高压季节性移动与海温场之间的联系。结果表明: 副高的两次北跳与东西进退都与海温

Hu Zengzhen and Huang Ronghui. 1997. The interannual variation of the connective activity in the tropical West Pacific in winter and its effect on the storm track in the North Pacific. Scientia Atmospherica Sinica 21(5):513-522.

Diagnostic analysis shows that convective activities around the Philippines have a 2 to 4 year period of oscillation in the 1980s. The storm track in the North Pacific has a linear strengthening, a northward and eastward trend, and the obvious 2 to 4 year period of oscillation. There are close connections between the anomaly of convective activities and storm track variation in the North Pacific on the 2 to 4 year time scale. The center of the storm track in the North Pacific is strong (weak), eastward (westward), northward (southward) when the convective activities around the Philippines are strong (weak). The physical mechanism producing this connection is considered to be a forced anomaly wave train from east Asia to North America (ANA) via North Pacific when the convective activities around the Philippines are strong (weak). At the same time, both the positive (negative) anomaly in the west coast of the U.S.A. and the negative (positive) anomaly to its north increase (decrease) the pressure gradient, so that the jet stream and the storm track centered in the North Pacific are strong (weak), northward (southward) and eastward (westward).

Keywords: Philippines, convective activities, storm track in the North Pacific, East Asia-North Pacific-North America teleconnection pattern, 2 to 4 year period of oscillation



Jiang Quanrong, Zheng Dingying, and Yu

Zhihao. 1997. The relationship of the seasonal movement of the subtropical high over the northwestern Pacific with sea surface temperature (SST). Scientia Atmospherica Sinica 21(2):199-204.

Based on empirical orthogonal function (EOF), the relationship of the seasonal movement of the subtropical high over the northwestern Pacific with sea surface temperature (SST) is discussed. The results show that the two north jumps and

场的扰动加热有关, 海洋的热力强迫作用是引起大气环流系统季节性变化的重要原因之一。

关键词: 副热带高压 海温

季节性移动

east-west movement of the subtropical high are closely related with the perturbation of SST. The role of the oceanic thermal forcing is one of the most important reasons causing the seasonal variation of the atmospheric circulation.

Keywords: subtropical high, sea surface temperature, seasonal movement



卞林根, 陆龙骅,

贾朋群, 1997, 南极地区温度和海冰的变化特征及相互关系, 大气科学, 21(5): 564-572

Bian Linggen, Lu Longhua, and Jia Pengqun.

1997. Characteristics of Antarctic surface air temperature and sea ice variations and their relationship. Scientia Atmospherica Sinica 21(5):564-572.

对南极地区温度和海冰的时空变化特征及相互关系进行了初步研究, 结果表明: 近30年来南极地区有明显的变暖趋势, 时空差异比较明显。其中以南极半岛地区的变暖趋势最大, 是整个东南极沿岸增温率的2—3倍。近20年来, 平均南极海冰面积和南极平均温度的变化趋势相反, 年际变化的相关关系不显著。经过聚类分析划分出不同的气候区, 能清楚地显示出这两者的关系。

关键词: 南极 温度 海冰

时空特征

Temporal-spatial characteristics of Antarctic surface air temperature and sea ice variations are statistically analyzed. Results show that, during the last 30 years there is an obvious warming trend in Antarctica, but there exist substantial differences in different regions and different time periods. The most significant warming trend occurred in the Antarctic Peninsula, about 2 to 3 times greater than in the whole east Antarctica. In the last 20 years the correlation between Antarctic mean temperature and mean sea ice area is low and insignificant, but their linear trends are found to be opposite in all regions, that is, sea ice extent is reduced when temperature is high. The different climate regions defined by cluster analysis clearly show a close relationship between the two parameters on an inter-seasonal time scale.

Keywords: Antarctica, temperature, sea ice, temporal-spatial characteristic

王晓春,

吴国雄, 1997, 中国夏季降水异常空间模与副热带高压的关系, 大气科学, 21(2): 161-169

利用1959—1994年6、7、8月全国范围47个 $5^{\circ} \times 5^{\circ}$ 经纬度网格降水资料分析了夏季降水异常空间模的月际差异, 并在此基础上用西太平洋副高指数及青藏高原指数 $B$ 分析降水异常空间模与环流的关系, 为检验环流指数与降水相关场的整体信度, 还对8月份降水资料进行了Monte-Carlo检验。

认为中国夏季总降水异常的空间模在一月份中并非表现的同样清楚, 江淮流域与河套及华南的反相关在8月份表现的最清楚。而青藏高原中东部南北两侧的负相关在6月及8月很清楚, 7月次之。8月份西太平洋副高北界异常对江淮流域与河套及华南地区降水异常反相关的产生有很大的作用。

关键词: 夏季降水异常空间模  
西太平洋副高指数 青藏高原指数 $B$   
整体信度

Wang Xiaochun and Wu Guoxiong. 1997. The analysis of the relationship between the spatial modes of summer precipitation anomalies over China and the atmospheric general circulation. *Scientia Atmospherica Sinica* 21(2):161-169.

The precipitation data at  $5^{\circ}$  by  $5^{\circ}$  grid (June, July, and August) from 1959 to 1994 are used to analyze the monthly change of the spatial mode of summer precipitation anomalies over China. The relationship between the spatial mode of summer anomalies and the atmospheric general circulation is analyzed using indices of the Northwestern Pacific high and the geo-potential height index  $B$  of the Tibet Plateau. The Monte-Carlo method is used to evaluate the significance level of the collective significance of the correlation field between the circulation index and precipitation. The results show that the negative correlation between the precipitation anomaly over the lower-reaches of the Yangtze River and Huaihe River valley (LRHY region) and that over the middle-reaches of the Yellow River (MRHY region) and over South China is the most significant in August. The negative correlation between the precipitation over the southern part of the eastern Tibetan Plateau is more significant in June and August than in July. The analysis for the correlation between indices of the Northwestern Pacific high and monthly precipitation show that the anomaly of the north boundary of the Northwestern Pacific high in August has the greatest influence on LRHY region.

Keywords: spatial mode of summer precipitation anomalies, indices of the Northwest Pacific high, geo-potential height index  $B$  of the Tibet Plateau, collective significance



林而达, 1997, 气候变化与农业——最新的研究成果与政策考虑, 地学前缘, 4(2): 221-226

全球气候变化将严重地限制世界农业生产, 并引起广泛的饥荒, 这已经引起了人们的关注和争论。未来

Lin Erda. 1997. Climate change and agriculture: Research finding and policy consideration. *Earth Science Frontiers* 4(2):221-226.

Global climatic change that would seriously limit agricultural production and cause widespread famine and starvation has been studied closely and is a source of controversy. The agricultural impacts of potential climate change have now

气候变化对农业的可能影响目前已经进行了一些详细的研究,虽然还有许多不确定性,但还没有发现全球的食物供应会受到严重威胁。采取适应对策在一些国家可以产生节省成本的后果,但随之而来的新增成本会给发展中国家造成严重的障碍。农业减缓政策的顺利实施取决于能否减少技术转让与扩散的障碍,是否能获取可用资金。

关键词: 气候变化 农业影响  
适应对策 减缓对策 政策考虑

been investigated in some detail. Although uncertainties remain, overall studies conducted do not find the global food supply seriously threatened. Even though some adaptation strategies could result in cost savings for some countries, the incremental costs of adaptation strategies could result in a serious burden for developing countries. Agricultural mitigation depends on reducing barriers to the diffusion and transfer of technology, mobilizing financial resources, and supporting capacity building in developing countries.

Keywords: climate change, agricultural impact, adaptation, mitigation, policy consideration



柯长青, 李培基, 王采平, 1997,  
青藏高原积雪变化趋势及其与气温  
和降水的关系, 冰川冻土,  
19(4): 289-294

根据青海、西藏60个地面基本气象台站1957—1990年逐日雪深、月平均气温、月降水量观测记录,采用自回归滑动平均模型分析了青藏高原积雪变化趋势,结果表明,高原积雪变化呈普遍增进趋势。青藏高原气温与降水的变化趋势也是增加的,积雪深度与冬季气温之间呈现弱负相关关系,而与冷季降水呈正相关。表明积雪的增加是由冷季降水的增加所引起的。

关键词: 青藏高原 积雪 变化趋势  
全球变暖 二元回归分析

Ke Changqing, Li Peiji, and Wang Caiping.  
1997. Variation trends of snow cover over the Tibetan Plateau and their relationship to temperature and precipitation. Journal of Glaciology and Geocryology 19(4):289-294.

Daily snow depth data, together with monthly average temperature and monthly total precipitation, at 60 primary weather stations from 1957 to 1990 were analyzed using autoregressive moving average (ARMA) (p,q) and multiple linear regressive analysis. The results show an increasing trend of snow volume almost omnipresent over the entire Tibetan Plateau, with some local decreasing trends. The secular trend of cold season temperature and precipitation in the Tibetan Plateau is also increasing. A significant positive correlation exists between snow cover and precipitation, but the correlation of snow cover and temperature is negative over the Tibetan Plateau. The increase of snow cover results from the increase of precipitation during the cold seasons with global warming.

Keywords: Tibetan Plateau, snow cover, variation trends, global warming, multiple linear regressive analysis

赖祖铭, 1997, 试论温室效应对我国西部河川径流的影响。冰川冻土, 19(1): 10-16

本文利用假设气候情景和统计模型, 讨论并估计了我国西部河川径流在CO<sub>2</sub>加倍情况下的可能变化。大气中日益增多的温室气体导致我国西部地区的气候在四十年来出现了干暖化趋势, 河川径流量明显减少。据统计, 从50年代后半期到80年代, 新疆地区的河川径流量减少了6.4%; 西藏东南部的三条大河从60年代到80年代则平均减少了13.2%, 其减少量远大于新疆。主要因为气温升高使冰雪融水增加, 新疆的河流受到冰雪融水的补偿。

关键词: 温室效应 河川径流 影响

**Lai Zuming.** 1997. Impact of the greenhouse effect on runoff in West China. *Journal of Glaciology and Geocryology* 19(1):10-16.

In this paper, the climatic variations in West China are discussed and analyzed using climate scene and statistics modeling. In the last forty years, climate warming and decreasing precipitation are notable in West China because of the rapid development of industries and agriculture, increasing the greenhouse gases in the atmosphere. According to statistics from the late 1950s to the 1980s, the total runoff was reduced 6.4% in the Xinjiang Region, and from the 1960s to the 1980s it was reduced 13.2% on average in the three large rivers in the southern Tibet Region. The decreasing range in the Xinjiang Region is less than that in the southeastern Tibet Region. The reason is that decreasing precipitation is compensated by increasing glacier and snow meltwater in the Xinjiang Region.

Keywords: greenhouse effect, runoff, impact



尚可政, 杨德保, 王式功, 孟梅芝, 1997, 黄河上游水电工程对局地气候的影响, 干旱区地理, 20(1): 57-64

本文介绍了黄河上游段水电工程概况, 并以刘家峡和龙羊峡水库为主对库区周围各站建库前后各5年或10年的气象资料进行了对比分析, 揭示了水库对周围地区各气候因子的影响程度。结果表明: 水库对库区周围地区气候环境起到了不同程度的改善作用, 对水库及水库下游的水温起到了不同程度的调节作用, 改善了黄河流域的农业生产条件。

关键词: 水电工程 气候效应  
黄河上游

**Shang Kezheng, Yang Debao, Wang Shigong, and Meng Meizhi.** 1997. Influence of water conservancy and power projects on local climate at upper reach of the Yellow River. *Arid Land Geography* 20(1):57-64.

A survey of the water conservancy and power projects at the upper reaches of the Yellow River is briefly introduced. The influence of the Liujiaxia Reservoir and the Longyangxia Reservoir on the local climate is studied by comparing the analyzed results of the meteorological data from the meteorological stations near the two reservoirs. The results are as follows: After the reservoirs were built, the mean annual air temperature and water temperature went up, and the daily differences of air temperature and water temperature were lower at the areas near two reservoirs and the lower reaches of the Yellow River as a result of the heat storage of the reservoirs. The reservoirs are relatively cold sources in spring and summer and warm sources in autumn and winter. The atmospheric layer is stabilized, which makes

convection, low-level clouds, and thunderstorms decrease and sunshine duration increase at the reservoir areas.

Keywords: water conservancy and power project, climatic effect, upper reaches of the Yellow River.



**李峰**, 1997, 全球气候变化与我国荒漠化监测的关系, 干旱区资源与环境, 11(3): 28-33

在全新世以来我国主要沙地和沙漠景观动态变化与全球气候波动对应关系分析的基础上, 对全球气候变化与我国荒漠化监测的关系进行了研究。结果表明: 全球气候变化在时空两方面影响着我国的荒漠化监测, 尤其是全球气候变化在空间范围上对土地荒漠化的不同影响。这包括我国东部和西部地区土地荒漠化对全球气候变化的响应度和灵敏度两方面。

关键词: 全球气候变化 土地荒漠化 荒漠化监测

**Li Feng**. 1997. Global climatic variation and desertification monitoring in China. *Journal of Arid Land Resources and Environment* 11(3):28-33.

The paper analyzes the relationship between global climatic fluctuation and dynamic landscape changes of the main sandy lands and deserts in China since the Holocene. The monitoring showed that global climatic variation affected desertification in China in both space and time, especially spatial influences. The responsiveness and sensitivity to climatic changes are different in the eastern part and western part of China.

Keywords: global climatic variation, land desertification, desertification monitoring



## Modeling

**董敏, 李跃凤,**  
**沈文海**, 1997, 东亚气候的模拟与验证研究, 气象学报, 55 (6) : 692-702

文中利用NCAR的气候模式CCM2对东亚气候进行了模拟研究, 并应用美国环境预测中心重新分析资料和中国降水资料对模拟结果进行了检验。检验表明, 该模式能够较好

**Dong Min, Li Yuefeng, and Shen Wenhai**. 1997. Validation study on the East Asian climate simulated by CCM2. *Acta Meteorologica Sinica* 55(6):692-702.

Using the National Center for Atmospheric Research (NCAR) community climate model 2 (CCM2), the simulated East Asian climate was analyzed and checked against observation data and information. The large-scale features of the East Asian climate were simulated pretty well by the model, though there are still some discrepancies between the model output and

地描述东亚地区的大尺度气候特征, 模拟的高度场、温度场等比较接近实际。对东亚季风气候具有决定性影响的系统, 如副热带高压、蒙古高压、印度低压以及西风急流等也模拟比较好。检验结果还表明, 对湿度场的不如高度、温度及风场的模拟, 夏季西风急流的模拟不如冬季。CCM2对东亚降水的模拟效果较差。这表明CCM2在模式物理过程方面(如: 对流参数化, 垂直输送过程, 陆面过程及地形等)需要进行较大改进。

关键词: 东亚季风 模拟 验证

observation. The simulated geopotential height, wind, and temperature fields are very close to the observation. The large-scale systems, such as the subtropical high, Mongolia high, and Indian low, which have an important influence on the East Asia Monsoon are also simulated pretty well. The moisture field is not simulated as well as the fields just mentioned. The simulated precipitation of the model has a rather big difference from the observation. These differences suggest that some physical processes in the CCM2 need to be improved.

Keywords: East Asia climate, simulation, validation



张荣华, 曾庆存,

周广庆, 1997, 一个混合型热带海洋—大气耦合模式——

I. 模式构成及热带太平洋气候态模拟, 大气科学, 21 (2): 129-140

**Zhang Ronghua, Zeng Qingcun, and Zhou Guangqing.** 1997. A hybrid coupled tropical atmosphere-ocean model part I: Model formulation and simulated tropical Pacific climatology. *Scientia Atmospherica Sinica* 21(2):129-140.

此项研究基于由一阶斜压模表示的自由大气和混合行星边界层所组成的简单热带大气模式(ML)和大气物理研究所高分辨自由表面热带太平洋环流模式(OGCM)创建了一个用于探索热带海洋—大气系统相互作用和El Nino/Southern Oscillation

动力过程的混合型耦合模式。两模式之间进行如下耦合: 简单大气模式计算出海表风应力, 热通量由松驰公式计算, 淡水通量(蒸发与降水之差)由观测资料给定, 它们一起作为海洋环流模式

(OGCM)的强迫场; 而OGCM计算出海表温度(SST), 在其以外地区给定观测到的气候海表温度或陆地温度, 作为大气模式的边界条

The research developed a hybrid coupled model (HCM) of the tropical atmosphere-ocean to study the tropical air-sea interactions and El Niño/Southern Oscillation (ENSO) cycles. The atmospheric component is a simple tropical model consisting of a well-mixed planetary boundary layer (Lindzen-Nigam model) and a free troposphere represented by the first-order baroclinic model (Gilltype model) in the tropical Pacific. The oceanic component is the Institute of Atmospheric Physics (IAP) free-surface tropical Pacific oceanic general circulation model (OGCM). The coupled model can produce both annual mean and seasonal cycle climatology as well as short-term climate variations. The coupling procedure consists of exchanging the surface fluxes (i.e., the surface wind stress) estimated from the simple atmosphere together with the heat flux calculated by the Haney relation formula and the prescribed water flux are used to force the OGCM; the OGCM calculates sea surface temperature (SST) within the domain and uses the observed surface temperature outside the domain, which gives the surface boundary condition for the atmospheric model. The

件。并采用逐日、同步耦合方案，未采用任何通量修正进行了26年数值分析，对热带太平洋气候态进行模拟。结果表明，耦合模式未出现气候漂移现象，并且非常成功地再现了热带太平洋大气和海洋环流平均态及其季节变化。

关键词：简单热带大气模式  
海洋环流模式 海气耦合  
气候态模拟

simulations of the tropical Pacific climatology are conducted using synchronous daily coupling and numerical results without flux correction. It is shown that the coupled model is free from climate drift and is able to accurately reproduce the observed tropical Pacific climatology of the atmosphere and ocean and their seasonal variations.

Keywords: simple tropical atmosphere model, oceanic general circulation model (OGCM), coupling simulated climatology of the tropical atmosphere and ocean



叶佰生, 陈克恭,  
施雅风, 1997, 冰川及其径流对气候  
变化响应过程的模拟模型——  
以乌鲁木齐河源1号冰川为例, 地  
理科学, 17 (1): 32-40

应用冰川动力学模型结合冰川径流模型模拟乌鲁木齐河源1号冰川东支达到稳定状态的过程以及不同气候变化条件下冰川的响应过程。结论如下：1号冰川在维持目前气候变化条件下稳定长度约为1600m；若未来气温升高1℃（加之冰川冷却作用减少，冰川区实际升温约为2℃），1号冰川东支将退缩为只有300m的悬冰川；目前1号冰川的径流量正处于一个相对稳定状态的高峰值；气温升高将引起冰川径流在升温初期增加，之后将迅速减少；径流在升温初期的增加量及峰值出现时间取决于升温的速度。

关键词：冰川 径流 气候变化  
乌鲁木齐河

Ye Baisheng, Chen Kegong, and Shi Yafeng.  
1997. Responses of glacier and glacial runoff to climatic change: A model to simulate Glacier No. 1 in headwaters of the Urumqi River. Scientia Geographica Sinica 17(1):32-40.

Using a dynamic glacier model, the processes and responses of Glacier No. 1 in the headwaters of the Urumqi River to various future climatic scenarios are discussed. The conclusion is as follows: Glacier No. 1 in headwaters of the Urumqi River will continue to retreat if current climatic conditions prevail until it reaches a steady state of 1600 m in length. If the air temperature were to rise 1°C (rise of 2°C actually, because the cooling function of the glacier would decrease), the glacier would degenerate and become a hanging glacier with a length of 300 m after 700 to 800 years. The current glacial runoff is higher in comparison with that of the equilibrium state under the current climatic condition. If the air temperature continues to rise, however, the runoff of the glacier would increase and reach a new peak but then decrease rapidly.

Keywords: glacier, runoff, climatic change, Urumqi River



杜鹏, 李世奎, 1997, 农业气象灾害风险评价模型及应用, 气象学报, 55 (1): 95-102

根据灾害风险分析原理, 以改进的农业生态地区法为基础, 建立了一个经三级放大的农业灾害风险分析实用模型(概念模型、过渡模型、实用模型)。并以华南荔枝生产为例进行了农业气象风险分析, 计算了主要的农业气象灾害以及风险体系的风险度。

关键词: 农业气象灾害  
风险评价模型 荔枝

Du Peng and Li Shikui. 1997. An agro-meteorological disaster risk analysis model and its application. Acta Meteorologica Sinica 55(1):95-102.

On the basis of the principles of disaster risk analysis and the method of improved agricultural ecological areas, a practical model of agro-meteorological disaster risk analysis is established. It was developed from the gradual three-level enlargement of a basic concept model (basic concept model, transitional model, practical model). The risk degrees of main agro-meteorological disasters and risks of litchi cultivation in Southern China are analyzed and calculated.

Keywords: agro-meteorological disaster, risk analysis model, litchi



邓北胜, 熊廷南, 周小刚, 1997, 三峡地区枯水期区域性强降水的一种天气模型, 气象, 23(5):22-25

根据长江三峡地区1961-1994年10月-1月逐日降水资料及三峡地区枯水期区域性强降水标准确定了该地区发生区域性强降水的雨日, 并运用天气统计学方法对同期的历史天气图进行分析产生区域性强降水的原因、影响系统以及环流形式特征。总结出三峡地区产生区域性强降水的两脊两槽型大气环流形式的环流特征, 归纳出一种较为实用的预报模型, 概括出两脊两槽环流型前期预报指标。通过利用1995年的检验和1996年10、11月试报的结果证明, 该模型及前期预报指标是具有预报参考价值。

Deng Beisheng, Xiong Tingnan, and Zhou Xiaogang. 1997. A synoptic model for regional severe precipitation forecast in the dry season in Sanxia on the Changjiang. Meteorological Monthly 23(5): 22-25.

Using the daily date of precipitation during October to January from 1961 to 1994 and the criteria of regional severe precipitation in the dry season in the Sanxia area, the days of regional severe precipitation in the area are ascertained. The reasons, the impacting systems, and the features of general circulation for regional severe precipitation in the area are analyzed using the historic synoptic charts for the same period. The features of general circulation of two ridges and two troughs models during regional severe precipitation in Sanxia area are summarized. A synoptic model for forecasting regional severe precipitation in the dry season in the Sanxia area on the Changjiang is given. The predictive indexes of the circulation pattern are drawn. The operational experiment shows that the two ridges and two troughs model and its predictive indexes are of preferential value to forecast the regional severe precipitation in dry season in Sanxia on the Changjiang.

关键词: 强降水 大气环流  
预报指标

刘景涛, 高涛,  
康玲, 1997, 寻找相似天气过程的一种数学模型,  
应用气象学报, 8(1):78-84

文章设计了一种寻找相似天气过程的数学模型, 利用Saaty论述的方法构造判别矩阵进行判别, 从而计算出实时天气图与历史资料库中天气图的相似排序及相似度。这种方法经预报试验证明效果良好。

关键词: 相似技术 数学模型  
预报试验

范广洲, 罗四维,  
吕世华, 1997, 青藏高原冬季积雪异常对东、南亚夏季风影响的初步数值模拟研究, 高原气象,  
16(2): 140-152

利用一个耦合了简化的简单生物圈模式的大气环流谱模式(SSIB-GCM), 初步探讨了青藏高原冬季积雪异常对东、南亚夏季风环流和降水的影响及其机理。结果表明: 高原地区冬季积雪增加将使随后的夏季东、南亚季风明显减弱, 主要表现为东、南亚季风区降水减少, 索马里急流、印度季风槽和印度西南气流减弱。另外, 还提出了欧亚大陆雪盖与整个高原雪盖和高原东部雪盖对东、南亚夏季风影响的敏感性问题的。

Keywords: severe precipitation, general circulation, forecast index



Liu Jingtao, Gao Tao, and Kang Ling. 1997. A mathematical model for searching analogue weather process. Quarterly Journal of Applied Meteorology 8(1):78-84.

The paper developed a new mathematical model for searching the analogue weather process, in which the discriminant matrix is made by means of the Saaty method. The analogue order and analogue degree are calculated using the matrix, and the model has proved to be very useful in operational weather forecasting.

Keywords: analogue technique, mathematical model, forecast test



Fan Guangzhou, Luo Siwei, and Lu Shihua. 1997. The preliminary numerical experiments of the effect of anomalous snow cover over the Plateau in winter on east and south Asian summer monsoon. Plateau Meteorology 16(2):140-152.

A general circulation model, which has been coupled with a simple biosphere model, was used to assess the influence of anomalous Plateau snow cover in winter on the east and south Asian summer monsoon circulation and rainfall. The results point out that the summer monsoon in east and south Asia is weakened when the winter snow cover over the Plateau is increased. The main features are that the precipitation is reduced in the east and south Asian summer monsoon region and the Somali jet, the Indian monsoon trough, and the Indian southwest air flow are weakened. In addition, the sensitivity of the effects of the snow cover over Eurasia and the east Plateau on the Asian monsoon are also examined. It is found that the Plateau snow cover was more sensitive than that over Eurasia.

关键词: 高原积雪 东、南亚夏季风  
数值模拟

Keywords: snow cover over the Plateau, east  
and south Asian summer monsoon, numerical  
experiments



吴爱明,

倪允琪, 1997, 青藏高原对亚洲季  
风平均环流影响的数值试验,  
高原气象, 16(2): 153-164

**Wu Aiming and Ni Yunqi.** 1997. Numerical  
experiments of the influence of the Qinghai-  
Xizang Plateau on the mean circulation of the  
Asian monsoon. Plateau Meteorology  
16(2):153-164.

利用垂直方向具有9层 $\sigma$ 面、水平方  
向菱形截断波数为15的全球大气环  
流谱模式和有、无青藏高原大地形  
两种情况下10年积分的模拟结果,  
研究了青藏高原大地形对亚洲积分  
平均环流的影响。结果表明: 有、  
无青藏高原大地形, 亚洲冬、夏季  
积分平均环流均存在很大的差异。  
关键词: 大气环流模式 青藏高原  
亚洲季风平均环流 季节变化

An atmospheric general circulation model  
(AGCM) resolution (with 9 sigma levels in the  
vertical and rhomboidal truncation at wave  
number 15 in the horizontal) was run for 10  
years with and without Qinghai-Xizang Plateau  
respectively (called TP and NTP experiments  
hereafter). Comparing the results of TP and  
NTP experiments, the influence of Qinghai-  
Xizang Plateau on the mean circulation of Asian  
monsoon is investigated. It found clear  
differences between the mean circulation of  
Asian monsoon with and without Qinghai-  
Xizang Plateau either in summer or in winter.

Keywords: atmospheric general circulation  
model (AGCM), Qinghai-Xizang Plateau, mean  
circulation of Asian monsoon, seasonal  
variation



## Radiation and Trace-Gas Emission

郑循华, 王明星, 王跃思, 沈壬兴  
, 上官行健, M. Kogge, J.  
Heyer, H.  
Papen, 金继生, 李老土, 1997,  
华东稻田 $\text{CH}_4$ 和 $\text{N}_2\text{O}$ 排放,  
大气科学, 21 (2): 231-237

**Zheng Xunhua, Wang Mingxing, Wang Yuesi,  
Shen Renxing, Shangguang Xingjian,  
M. Kogge, J. Heyer, H. Papen, Jin Jisheng,  
and Li Laotu.** 1997.  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emissions  
from rice paddy fields in East China. Scientia  
Atmospherica Sinica 21(2):231-237.

以太湖地区麦茬稻为例, 对稻田 $\text{CH}_4$   
和 $\text{N}_2\text{O}$   
排放进行了同步自动连续观测研究  
, 揭示了二者的相互关系。稻田  
 $\text{CH}_4$ 和 $\text{N}_2\text{O}$ 排放的季节变化规律完

The study reveals the mutual connection  
between methane ( $\text{CH}_4$ ) and nitrous oxide ( $\text{N}_2\text{O}$ )  
emissions on the basis of a synchronous  
automatic observation series on the  $\text{CH}_4$  and  
 $\text{N}_2\text{O}$  emissions from the Tai Lake rice paddy  
fields. The seasonal variations of  $\text{CH}_4$  and  $\text{N}_2\text{O}$   
emissions from rice fields are completely  
different. The  $\text{N}_2\text{O}$  emission intensively  
increases whereas  $\text{CH}_4$  emission decreases

全不同, 二者的排放通量随土壤水分条件的变化而互为消长, 但它们的日变化形式却有共同之处。晴天的 $\text{CH}_4$ 和 $\text{N}_2\text{O}$ 排放日变化规律明显, 主要表现为下午单峰模态, 有时 $\text{CH}_4$ 排在夜间出现一个次峰。 $\text{CH}_4$ 和 $\text{N}_2\text{O}$ 排放总量因肥料类型的不同而不同, 堆肥加尿素处理比 $\text{NH}_4\text{HCO}_3$ 处理少排放 $\text{N}_2\text{O}$  30%, 多排放 $\text{CH}_4$  12%。

关键词:  $\text{CH}_4$ 排放  $\text{N}_2\text{O}$ 排放 稻田

孙庆瑞, 王美蓉, 1997,  
我国氨的排放量和时空分布,  
大气科学, 55 (5): 590-598

根据我国实际情况确定了各种氨排放源的排放因子, 并采用排放因子的方法按省计算了我国历年的氨排放量和排放密度。我国自1960年以来, 氨的排放量逐年增加, 1993年达12Mt, 在各种氨源中以动物的贡献最大, 占52%。在测定的6个省市(北京、广西、广东、湖南、江西、山东)中, 北京的氨有明显的季节变化, 春、夏浓度高, 冬季低。氨的日变化中, 一般夜间浓度高于白天。还测定了氨的垂直分布, 计算了氨浓度的标高。

关键词: 氨 排放量 日变化

because of drainage. However, their patterns of diurnal variation are similar. On clear days, the order of  $\text{CH}_4$  and  $\text{N}_2\text{O}$  emission is distinct, the maximum emissions of both gases usually occur in the afternoon. Sometimes, another smaller peak of  $\text{CH}_4$  emission is observed during the night. Significant effects of fertilizer application on emissions were also detected.

Keywords:  $\text{CH}_4$  emission,  $\text{N}_2\text{O}$  emission, rice paddy fields



Sun Qingrui and Wang Meirong. 1997.  
Ammonia emission and concentration in the atmosphere over China. Scientia Atmospherica Sinica 55(5):590-598.

Statistical figures on ammonia ( $\text{NH}_3$ ) emission amounts for 27 provinces and 3 cities of China are presented and emission factors are determined. Since 1960, the amount of ammonia emission in China has increased year after year. The total ammonia emission amount was 12 Mt in 1993 with a major contribution (52%) from livestock wastes. The  $\text{NH}_3$  concentrations in the atmosphere were measured in Beijing, Guangdong, Guangxi, Hunan, Hubei, Jiangxi, and Shandong. The  $\text{NH}_3$  concentrations varied with season in Beijing. From the diurnal pattern, it can be seen that  $\text{NH}_3$  concentrations at night were often higher than those observed during the day. The ammonia concentrations were also measured at different elevations.

Keywords: ammonia, emission amounts, diurnal pattern

王木林, 程红兵, 李兴生, 温玉璞,

1997,

中国部分清洁地区大气中 $\text{N}_2\text{O}$ 的浓度, 气象学报, 55(3): 363-370

根据1993年4月-1995年8

月对中国部分清洁地区大气的 $\text{N}_2\text{O}$ 浓度进行的现场观测, (中国农科院试验田、中国科学院农业生态实验站二个农田及临安、龙凤山、瓦里关山三个大气本底站) 并采用气相色谱分析法, 对大气中 $\text{N}_2\text{O}$ 的背景特征及日、季变化进行了初步研究。研究表明: 农田大气中 $\text{N}_2\text{O}$ 平均浓度高达 $322.1-343.4\text{ppbv}$ , 这是土壤排放 $\text{N}_2\text{O}$ 的结果;

临安、龙凤山和瓦里关山大气本底观测站(WMO/GAW)平均浓度分别为 $318.8 \pm 8.4\text{ppbv}$ ,

$317.4 \pm 4.7\text{ppbv}$ 和 $314.0 \pm 4.2\text{ppbv}$ 。

在此基础上, 对大气中 $\text{N}_2\text{O}$ 的分布及变化特征进行了分析。并且还初步分析和评价了现场取样和浓度测量技术。

关键词: 氧化亚氮 本底浓度

气相色谱法

郑循华等, 1997, 华东稻麦轮作生态系统 $\text{NO}_2$ 的排放研究,

应用生态学报, 8(5): 493-499

根据对华东稻麦轮作周期的 $\text{NO}_2$ 排放及其影响因子的连续观测结果, 分析了 $\text{NO}_2$ 排放的季节变化和日变化。同时还分析了温度、土壤水分状况、施肥和土壤 $\text{NO}_2$ 和 $\text{NH}_3$ 量对 $\text{N}_2\text{O}$ 排放的影响, 并对稻田 $\text{NO}_2$ 和 $\text{CH}_4$ 排放进行了比较分析。结果表明: 华东稻麦轮作生态系统的 $\text{NO}_2$ 和 $\text{CH}_4$ 排放具有完全不同的季节变化

Wang Mulin, Cheng Hongbing,

Li Xingsheng, and Wen Yupu. 1997. The

background levels of atmospheric nitrous oxide in some regions of China. Acta Meteorologica Sinica 55(3):363-370.

The paper discusses the background feature of nitrous oxide ( $\text{N}_2\text{O}$ ) and its diurnal and seasonal variation according to observation of atmospheric  $\text{N}_2\text{O}$  concentration in some unpolluted regions of China from April 1993 to August 1995. Results show that the average mixing ratios of  $\text{N}_2\text{O}$  over agricultural fields are from 322.1 to 343.4 ppbv. The larger values and variations of  $\text{N}_2\text{O}$  are the result of emission of  $\text{N}_2\text{O}$  from fertilized soils. The mean mixing ratios of  $\text{N}_2\text{O}$  at the Linan and Longfengshan Background Air Pollution Monitoring Station and Waliguanshan World Meteorological Organization/Global Atmosphere Watch (WMO/GAW) baseline observatory are  $318.8 \pm 8.4\text{ppbv}$ ,  $317.4 \pm 4.7\text{ppbv}$  and  $314.0 \pm 4.2\text{ppbv}$ , respectively. The distribution and variation of  $\text{N}_2\text{O}$  are discussed. Also, the sampling technique and measuring method of the mixing ratio of  $\text{N}_2\text{O}$  are specially analyzed and assessed.

Keywords: nitrous oxide, background levels, gas chromatography



Zheng Xunhua et al. 1997. Nitrogen dioxide ( $\text{NO}_2$ ) emission from rice-wheat ecosystems in East China. Chinese Journal of Applied Ecology 8(5):493-499.

Based on the observation of  $\text{NO}_2$  emission from rice-wheat rotation in East China, its seasonal and diurnal variation and the effects of temperature, soil moisture, fertilization, and availability are discussed. Meanwhile, the methane ( $\text{CH}_4$ ) and  $\text{NO}_2$  emissions from the rice season are analyzed comparatively. The study shows that the amount of  $\text{NO}_2$  emitted during the rice season only accounts for about 30% of the whole rotation cycle. The  $\text{CH}_4$  emission increases 26% with flooding in the rice season, and  $\text{NO}_2$  emissions from rice-wheat rotation

规律。在稻麦轮作周期内, 其生长季的 $\text{NO}_2$ 排放量仅占30%, 稻田持续淹水比常规灌溉增加 $\text{CH}_4$ 排放量26%, 减少 $\text{NO}_2$ 排放量11-26%  
 关键词:  $\text{NO}_2$ 排放 时间变化  
 控制因子  $\text{CH}_4$ 排放 稻麦轮作系统

cycle are reduced 11 to 26%, compared with normal irrigation.

Keywords:  $\text{NO}_2$  emission, temporal variation, regulating factor,  $\text{CH}_4$  emission, rice-wheat rotation system



卢维盛等, 1997, 广州地区晚稻田 $\text{CH}_4$ 和 $\text{NO}_2$ 的排放通量及其影响因素, 应用生态学报, 8(3): 275-278

Lu Weisheng et al. 1997. Methane ( $\text{CH}_4$ ) and nitrogen dioxide ( $\text{NO}_2$ ) fluxes from late-rice fields in the Guangzhou region and the factors affecting emission. Chinese Journal of Applied Ecology 8(3):275-278.

采用密闭箱法同时观测了广州地区晚稻田 $\text{CH}_4$ 和 $\text{NO}_2$ 的排放通量, 研究了水分管理及水旱轮作的影响。研究表明: 连续淹水、常规轮作和水旱轮作等三种处理方式的 $\text{CH}_4$ 平均排放通量分别为 $17.63$ 、 $2.84$ 和 $0.36 \text{ mg} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ , 而 $\text{NO}_2$ 的平均排放通量分别 $6.47$ 、 $11.69$ 和 $55.07 \mu \text{g} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ , 这说明稻田 $\text{NO}_2$ 和 $\text{CH}_4$ 排放之间存在着消长关系。稻田连续淹水显著增加 $\text{CH}_4$ 的排放而降低 $\text{NO}_2$ 的排放, 水旱轮作降低 $\text{CH}_4$ 排放却增加 $\text{NO}_2$ 的排放。并且讨论了这两种气体排放的影响因素及各自对温室效应的相对贡献。

Using a closed chamber method, methane ( $\text{CH}_4$ ) and nitrogen dioxide ( $\text{NO}_2$ ) emissions from late-rice fields in the Guangzhou region were measured simultaneously. It is revealed that when treated by continuous flooding, rotation succession cropping, and rice-vegetable rotation, the mean  $\text{CH}_4$  emissions are  $17.63$ ,  $2.84$ , and  $0.36 \text{ mg} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$  respectively, whereas the mean  $\text{NO}_2$  emissions are  $6.47$ ,  $11.69$ , and  $55.07 \mu \text{g} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$  correspondingly. This indicates a trade-off between  $\text{CH}_4$  and  $\text{NO}_2$  emission. The continuous flooding can greatly increase  $\text{CH}_4$  emission, while significantly reducing  $\text{NO}_2$  emission. But with a rice-vegetable rotation the reverse is true. The factors affecting  $\text{CH}_4$  and  $\text{NO}_2$  emissions are also discussed, and the contribution of  $\text{CH}_4$  and  $\text{NO}_2$  to global warming is preliminarily analyzed.

关键词: 稻田  $\text{CH}_4$ 和 $\text{NO}_2$ 排放通量  
 水分管理 水旱轮作

Keywords: rice field,  $\text{CH}_4$  and  $\text{NO}_2$  fluxes, water management, rice-vegetable rotation



李晶等, 1997, 水稻田甲烷的减排方法研究, 中国农业气象, 18(6): 9-18

Li Jing et al. 1997. Studies on the mitigation of methane emission from rice fields. Agricultural Meteorology 18(6):9-18.

通过1987年以来对我国五大水稻产区稻田甲烷排放量的野外观测, 对

Based on field observation of the generation and emission factors of methane since 1987, the paper discusses three promising methods for mitigation of methane from rice fields. The effectiveness and

控制稻田甲烷排放的因子, 甲烷在土壤中产生转化的机理, 减排方法以及模式进行了研究。目前主要的减排方法: 用其他肥料代替传统有机肥、种植低甲烷排放的水稻品种、灌溉管理等。适宜于我国国情的方法是用杂交水稻代替常规稻、沼渣肥代替有机肥。前者经济效益好, 但后者社会效益和环境效益显著。

关键词: 甲烷 排放 杂交稻 沼渣  
层次分析法

economic benefits of each method for mitigation of methane emission from rice fields were analyzed using the cost-benefit analysis method Analytic Hierarchy Process (AHP). The major methods are using biogas pit residue to substitute for fresh organic fertilizers, rice cultivar selection, and water regime. Using the hybrid rice instead of conventional rice cultivars and using biogas pit residue to substitute for fresh organic fertilizers are appropriate for China. The economic benefit of the first one is significant, but the social and environmental benefits of the second method make it better than the first method.

Keywords: methane, emission, hybrid rice, biogas pit residues, AHP



王文兴, 卢筱凤, 庞燕波, 汤大纲, 张婉华, 1997, 我国氨排放强度的地理分布, 环境科学学报, 17(1): 2-7

根据我国畜禽、氮氨肥施用和生产以及人口数量和相应的排放因子, 计算了全国氨的排放量、排放强度地理分布和1951-1992

年历年的排放量。结果表明, 1991年氨的排放总量为891.8kt, 其中畜禽、氨肥施用、人粪便与氨肥生产的排氨量分别为64%、18%

、17%和1%。

氨的排放强度最大的地区在我国中东部和四川的成渝地区。全国平均氨排放强度为 $0.9\text{kg}(\text{NH}_3)/(\text{km}^2\text{a})$ 。

关键词: 动物 肥料 地理分布  
氨排放强度

Wang Wenxing, Lu Xiaofeng, Pang Yanbo, Tang Dagang, and Zhang Wanhua. 1997. Geographical distribution of  $\text{NH}_3$  emission intensity in China. Acta Scientiae Circumstantiae 17(1):2-7.

The anthropogenic emissions of ammonia in China are calculated based on the number of livestock, poultry, fertilizer applications, and human beings. The results show that the emission of ammonia reached 891.8 kt in 1991, among which  $\text{NH}_3$  emissions from animals, nitrogen fertilizer application, human beings, and fertilizer production accounted for 64%, 18%, 17%, and 1%, respectively. The geographical distribution of emission intensity and emission trends were also estimated.

Keywords: animals, fertilizer, geographical distribution,  $\text{NH}_3$  emission intensity

许晓斌等, 1997, 中国东北区域本底大气中酸性气体的研究, 中国环境科学, 17(4): 345-348

介绍了首次在我国黑龙江龙凤山大气本底污染监测站取得的 $\text{NO}_x$ 和 $\text{SO}_2$ 一年的连续观测资料及分析结果。龙凤山大气中 $\text{NO}_x$ 和 $\text{SO}_2$ 浓度低于我国空气质量I级标准, 有明显的季节变化, 夏季值最低, 冬季值最高。 $\text{NO}_x$ 和 $\text{SO}_2$ 浓度与风速、温度、相对湿度等气象要素有密切关系。  
关键词:  $\text{NO}_x$   $\text{SO}_2$  浓度变化 来源

Xu Xiaobin et al. 1997. A study on acidic gases in the regional background air in Northeastern China. China Environmental Science 17(4):345-348.

The paper introduces the in situ measurements of nitrogen oxides ( $\text{NO}_x$ ) and sulfur dioxide ( $\text{SO}_2$ ) in the surface air at Longfengshan for the first time. The data show that the levels were much lower than those of the Class I in the China National Air Quality Criteria. The obvious seasonal variations, with the lowest points in summer and the highest points in winter, were also observed. The concentrations of both gases were found to be closely related to the meteorological parameters, such as wind speed, temperature, and relative humidity.

Keywords:  $\text{NO}_x$ ,  $\text{SO}_2$ , variation of concentration, source



傅立新, 郝吉明, 周学龙, 何东全, 赵磊, 1997, 中国东部地区能耗和 $\text{SO}_2$ 排放趋势预测研究, 中国环境科学, 17(4):349-352

在系统研究我国东部18个省、市、自治区近几年能源消耗和 $\text{SO}_2$ 排放现状的基础上, 以1986—1990年的数据为现状背景值, 以1990年为基准年, 利用LEAP模式和排放系数法分别进行了2000年, 2010年, 2020年的能耗和 $\text{SO}_2$ 排放趋势预测。并考虑了三峡工程及核电等一些因素的影响。在结合点源排放状况后,  $\text{SO}_2$ 排放的结果采用科学方法进行了经纬度的网格化。  
关键词: 能源消耗  $\text{SO}_2$ 排放 趋势预测

Fu Lixin, Hao Jiming, Zhou Xuelong, He Dongquan, and Zhao Lei. 1997. Trends of energy consumption and  $\text{SO}_2$  emissions in the east part of China. China Environmental Sciences 17(4):349-352.

The Long-range Energy Alternatives Planning (LEAP) model and emission factor analysis are used to predict the future trends for 2000, 2010, and 2020 on the basis of systematic research on the current situation of energy consumption and sulfur dioxide ( $\text{SO}_2$ ) emission in 18 provinces in East China. The factors, including the Three Gorges project, nuclear power plants, and so on, are taken into account. Given power plants as point source, emission data are divided into  $100 \times 100 \text{ km}^2$  geographical grids.

Keywords: energy consumption,  $\text{SO}_2$  emission, trend prediction



于肖岚, 汤洁,

李兴生, 1997, 中国西部清洁大气中SO<sub>2</sub>和NO<sub>2</sub>的观测和分析, 应用气象学报, 8(1): 62-72

1994年8月-1995年

7月, 利用浸渍膜法在青海瓦里关大气本底站采集大气中SO<sub>2</sub>和NO<sub>2</sub>, 并使用离子色谱分析其浓度。测量结果表明, SO<sub>2</sub>和NO<sub>2</sub>的平均浓度分别为 $0.417 \times 10^{-9}$ 和 $0.055 \times 10^{-9}$ ,

SO<sub>2</sub>和NO<sub>2</sub>都具有较好的相关性, 相关系数 $r=0.87$ , 它们的平均比值为2.6左右。SO<sub>2</sub>和NO<sub>2</sub>的浓度受风向和季节的影响。偏东风时浓度较高, 偏西风时浓度较低。冬季时SO<sub>2</sub>和NO<sub>2</sub>的浓度水平较低而夏季浓度较高。

关键词: SO<sub>2</sub> NO<sub>2</sub> 清洁大气观测

Yu Xiaolan, Tang Jie, and Li Xingsheng.

1997. Observation and analysis of sulfur dioxide (SO<sub>2</sub>) and nitrogen dioxide (NO<sub>2</sub>) in clean air of Western China. Quarterly Journal of Applied Meteorology 8(1):62-72.

Atmospheric SO<sub>2</sub> and NO<sub>2</sub> were sampled during the period from August 1994 to July 1995 using the filter packs (FP) method, and the concentrations of these gases were analyzed with ion chromatography (IC) at the Waliguan background baseline station of Qinghai Province. The results indicate that the average concentrations of SO<sub>2</sub> and NO<sub>2</sub> are  $0.417 \times 10^{-9}$  and  $0.055 \times 10^{-9}$ , respectively. There is a good correlation between SO<sub>2</sub> and NO<sub>2</sub> concentrations with a coefficient of 0.87, the ratio of SO<sub>2</sub> to NO<sub>2</sub> given a linear regression of about 2.6. The concentrations of SO<sub>2</sub> and NO<sub>2</sub> vary with season and wind direction. Higher concentrations are easterly, and lower are westerly. The concentrations of SO<sub>2</sub> and NO<sub>2</sub> are lower in winter and higher in summer.

Keywords: SO<sub>2</sub>, NO<sub>2</sub>, clean air, observation



翁笃鸣, 李炬, 高歌, 孙治安, 1997, 晴天太阳总辐射的参数化及气候计算, 气象科学, 17(1): 1-9

利用北京、拉萨等站1753次实测资料, 并参考有关文献, 讨论了应用M.E别尔梁德理论式 $Q_0 = I_0 \sinh / (1 + fm)$ 作晴天总辐射参数化的可能性。提出了 $f$ 的新参数化方案, 这一新参数化方案不仅保持了较高的拟合精度, 而且具有普遍适用性。按此方案计算的各地晴天总辐射廓线形式, 与国内外探测结果一致。对青藏高原6站所作的晴天总辐射气候计算也与实际值相符。

关键词: 晴天太阳总辐射 参数化气候计算

Weng Duming, Li Ju, Gao Ge, and Sun Zhian. 1997. Parameterization of clear-sky total radiation and climatic scheme. Scientia Meteorologica Sinica 17(1):1-9.

Based on the 1753 samples from Beijing and Lahsa, the expression  $Q_0 = (I_0 \sinh) / (1 + fm)$  is used to investigate parameterization of clear-sky total radiation with a new scheme for calculating  $f$ . The new scheme has high universality in addition to maintaining a high fitting accuracy compared with the original scheme. It is superior to seven parameterization schemes and two radiation models as revealed by a comparison of computations. The form of the profile from the scheme agrees with observed profiles from home and abroad. The climatic calculation of the total radiation for six stations over the Tibetan Plateau agrees with these measurements.

Keywords: clear-sky solar total radiation, parameterization, climatic calculation

张一平, 1997, 城市区域内不同下垫面的有效辐射特征, 气象科学, 17(2): 169-175

以昆明为研究对象, 利用城市区域内气候观测资料, 定量分析了城市区域内不同下垫面的有效辐射特征、变化规律。结果表明, 城市区域内有效辐射的时间变化午前变化较缓, 午后较快; 城市区域内有效辐射的时间变化既受下垫面性质也受其所处的位置的影响。屋顶面因受遮蔽物影响较小, 昼间有效辐射均大于庭院中央; 道路面由于遮蔽最大, 昼间有效辐射多小于庭院中央, 并且它们之间的差值变化随时间的不同而不同。城市区域内有效辐射, 不仅在下垫面状况和所处位置不同时存在差异, 并且在不同时段, 其数值和变化也有所不同, 这势必影响市内不同地域的辐射平衡特征和小气候特征。

关键词: 城市区域 有效辐射  
不同下垫面

王可丽,

钟强, 1997, 青藏高原地气系统云辐射强迫的气候学特征, 高原气象, 16(1): 10-22

利用1985—1988年ERBE-S4和ISCCP-C2月平均资料

分析了青藏高原这一特殊气候区域地气系统云辐射强迫的气候学特征。结果表明, 冬、夏季云对地气系统辐射强迫的场分布形势有明显差异。高原地区冬季云的温室效应大于云的反射率效应, 而春、夏、秋三季的情况则与之相反。

Zhang Yiping. 1997. A study on the characteristics of net long-wave radiation on different underlying surfaces in the urban area. Scientia Meteorological Sinica 17(2):169-175.

Microclimatic observation was conducted at different underlying surfaces in the urban area of Kunming City. The net long-wave radiation was calculated with observed data. The results showed that in the urban area, the variation of the net long-wave radiation is moderate in the morning, but marked in the afternoon; the variations of the net long-wave radiation are considerably affected by the nature and position of the surface. In the daytime, on the rooftop, the net long-wave radiation is larger than at ground level. On the road, the net long-wave radiation is lower than at ground surface. The difference of the net long-wave radiation on the grass and the ground surface varies with time; the values and variations of the net long-wave radiation vary with time.

Keywords: urban area, net long-wave radiation, different underlying surfaces



Wang Keli and Zhong Qiang. 1997. The climatic characteristics of cloud radiative forcing of earth-atmosphere system over Qinghai-Xizang Plateau. Plateau Meteorology 16(1):10-22.

The climatic characteristics of cloud radiative forcing of earth-atmosphere system over Qinghai-Xizang Plateau are analyzed based on the data set of the Earth Radiation Budget Experiment (ERBE)-S4 and the International Satellite Cloud Climatology Project (ISCCP)-C2 from 1985 to 1988. It reveals that there are distinct differences in cloud radiative forcing of the earth-atmosphere system between winter and summer. Also the greenhouse effect of clouds is stronger than the reflective effect of clouds in winter and weaker in other seasons.

关键词: 青藏高原 地气系统  
云辐射强迫

Keywords: Qinghai-Xizang Plateau, earth-atmosphere system, cloud radiative forcing



张宪洲, 王辉民, 张谊光, 1997,  
青藏高原冬小麦田辐射能量收支的  
初步研究, 应用气象学报,  
8(2): 236-241

Zhang Xianzhou, Wang Huimin, and Zhang Yiguang. 1997. A study on the radiation budget of a winter wheat field on the Tibetau Plateau. Quarterly Journal Applied Meteorology 8(2):236-241.

通过对青藏高原地区冬小麦田的净辐射各分量的观测,  
探讨了净辐射及其各分量的日变化特征。结果如下,  
冬小麦田反射率和净辐射具有明显的日变化; 在冬小麦抽穗-成熟期, 麦田平均反射率为13.3%, 麦田平均净辐射在白天占总辐射75.0%,  
包括夜间占67.4%; 麦田净辐射和总辐射之间存在良好线性关系, 并提出了由总辐射计算净辐射的经验公式。  
关键词: 青藏高原 冬小麦  
辐射能量收支

The components of the radiation budget in a winter wheat field on the Tibetau Plateau were measured, and then their diurnal variations were analyzed. The results were as follows: There are obvious diurnal variations in reflectivity and net radiation; the average reflectivity was 13.3%, and the average net radiation was 75% of the global radiation in daytime or 67.4% of the global radiation including day and night during the measuring period. A linear relationship between net radiation and global radiation that can be used to calculate net radiation from global radiation was established.

Keywords: Tibetau Plateau, winter wheat, radiation budget



文军, 王介民, 1997,  
绿洲边缘内外近地面辐射收支分析,  
高原气象, 16(4): 359-366

Wen Jun and Wang Jiemin. 1997. An analysis of the surface radiation budget over the inside and outside of the Oasis boundary. Plateau Meteorology 16(4): 359-366.

1995年8月在甘肃河西黑河流域绿洲边缘内外进行了“干旱地区环境综合监测计划”的野外观测实验, 并对所收集到的近地面辐射收支观测资料进行了分析。结果表明, 在绿洲边缘内外, 近地面辐射收支特征、地表反射率及各辐射分量对净辐射通量密度的

A field experiment of “Arid Environment Comprehensive Monitoring 95” was done in August 1995. The experimental sites were near the Oasis boundary area in Hei River basin of Northwest China. Analytical results of the observational data show that the characteristics of the radiation budget, surface albedo, and contribution of radiation flux density components to net radiation flux density are different inside and outside of the Oasis site. The discrepancy of downward radiation flux density

贡献都存在差异；入射辐射通量密度值比较接近；绿洲上的反射率小于戈壁上的，

戈壁上反射率随太阳天顶角的变化主要是由近红外波段反射率随太阳天顶角的变化引起的；向上长波辐射通量密度白天戈壁大，

夜间绿洲大，并且戈壁上有明显的日变化过程；白天绿洲有效辐射通量密度小于戈壁上的，

夜间两者比较接近；白天近地面净辐射通量密度绿洲大于戈壁上的，

绿洲和戈壁上近地面净辐射通量密度的不同主要是由地表吸收太阳辐射通量密度特性的不同而引起的。

关键词：绿洲边缘 辐射 反射率

between two sites is small. Albedo is bigger over the Gobi site than over the Oasis site. Variation of albedo with solar zenith angle is mainly caused by near-infrared albedo. The upward long-wave radiation over the Gobi site is bigger than that over the Oasis site during daytime. Net radiation flux density over the Oasis site is bigger than that over the Gobi site. Albedo and the thermal condition of the land surface mainly cause the discrepancy of net radiation.

Keywords: Oasis Edge, radiation, albedo



温玉璞, 汤洁, 邵志清, 张晓春,

赵玉成, 1997,

瓦里关山大气二氧化碳浓度变化及地表排放影响的研究, 应用气象学报, 8(2): 129-136

Wen Yupu, Tang Jie, Shao Zhiqing, Zhang Xiaochun, and Zhao Yucheng. 1997. A study on atmospheric CO<sub>2</sub> concentration variations and emissions from the soil surface at Mt. Waliguan. Quarterly Journal of Applied Meteorology 8(2):129-136.

利用非色散红外气体分析方法, 在不受人为直接污染影响的瓦里关山进行了大气CO<sub>2</sub>的连续测量, 研究了我国内陆高原大气CO<sub>2</sub>本底浓度的变化特征。观测结果表明, 内陆大气随陆地植被的生长而有明显的季节和日变化; 其季节变化规律与全球大气CO<sub>2</sub>本底值的地理分布相一致。地表CO<sub>2</sub>排放的观测得出了冬季高原草甸土壤的排放特征, 即在冬季陆地植被光合作用基本停滞的情况下, 土壤的CO<sub>2</sub>排放率相对增强, 最大排放量可达170mg/m<sup>2</sup>·h。

Continuous measurements of atmospheric CO<sub>2</sub> were carried out using the non-dispersive infrared (NDIR) method at Mt. Waliguan where the environment is unaffected directly by local anthropogenic pollution. The characteristics of the atmospheric background CO<sub>2</sub> concentration variation for the inland Plateau of China are presented in this paper. The results show that the area has clear diurnal and seasonal variations related to the growing cycle of the land's vegetation and that the pattern of seasonal variation corresponds with the global geographical distribution of atmospheric CO<sub>2</sub>. Furthermore, the emission rates of CO<sub>2</sub> from the Plateau grassland soil were also measured. The results show that the CO<sub>2</sub> emission rate from the soil surface increases relatively in winter with the largest value above 170 mg/m<sup>2</sup>·h when the photosynthesis of vegetation is essentially stagnant.

关键词: 大气 CO<sub>2</sub> 本底浓度 变化  
地表排放

Keywords: atmospheric CO<sub>2</sub>, background  
concentration, variation, emission of grassland  
soil surface



季国良,  
吕兰芝, 1997, 格尔木太阳辐射与  
气温的多年变化, 高原气象,  
16(1):30-35

Ji Guoliang and Lu Lanzhi. 1997. Secular  
variation characteristics of solar radiation and  
air temperature at Golmud. Plateau Meteorology  
16(1):30-35.

利用格尔木1956—1994年的气温和  
太阳总辐射资料, 分析了该地区太  
阳总辐射和气温的多年变化特征及  
其相关关系。结果表明: 30多年中  
该地区太阳总辐射没有明显的减少  
趋势; 年平均气温60年代为低值,  
70年代迅速上升, 比东部平原地区  
提前, 且呈现“冬暖夏凉”的变化  
趋势; 70年代到90年代年平均气温  
与太阳总辐射呈现滞后一年的正相  
关; 夏季气温与同期太阳总辐射有  
很好的正相关, 但冬季的气温变化  
则与太阳总辐射呈负相关。

The secular variation characteristics and the  
relationship between global radiation and  
temperature are analyzed using the data of air  
temperature and global radiation from 1956 to  
1994 at Golmud. The results show that the  
decreasing tendency of global radiation was not  
obvious in these 39 years. The annual mean air  
temperature is low in the 1960s, and rapidly  
increases in the 1970s about 10 years earlier  
than in the eastern plain. There is a tendency  
toward warming in winter and cooling in  
summer. The relationship between annual air  
temperature and global radiation shows a  
positive correlation with a delay of one year  
from the 1970s to the 1990s. The relationship  
between air temperature and global radiation for  
the same period shows a positive and negative  
correlation in summer and in winter.

关键词: 能量收支 太阳辐射  
气温变化

Keywords: energy budget, solar radiation, air  
temperature variation



马耀明, 王介民, Massimo Menenti,  
Wim Bastiaanssen,  
1997, 黑河实验区地表净辐射区域  
分布及季节变化,  
大气科学, 21(6): 743—749

Ma Yaoming, Wang Jiemin, Massimo  
Menenti, and Wim Bastiaanssen. 1997. The  
distribution and seasonal variation of regional  
net radiation in the Heihe area. Scientia  
Atmospherica Sinica 21(6):743-749.

利用卫星遥感信息和地面观测资料  
, 分析研究地表净辐射的区域分布  
及季节变化特征。结果表明, 卫

By means of satellite remote sensing and field  
observation, the distribution and seasonal  
variation of regional net radiation in the Heihe  
area were analyzed. The results showed that the  
reasonable regional distribution and seasonal  
variation of surface albedo, surface

星遥感结合地面观测, 首先可以得到较为精确的地表反射率和地表温度变化, 进而得到较为合理的地表净辐射的区域分布和季节变化特征。

关键词: 黑河实验区 卫星遥感  
地表净辐射 区域分布 季节变化

temperature, and net radiation could be obtained with the aid of remote sensing and field observation.

Keywords: Heihe area, satellite remote sensing, net radiation of land surface, regional distribution, seasonal variation



陈渭民,

高庆先, 1997, 由GMS卫星资料获取我国夏季地表辐射收支, 大气科学, 21(2): 238-246

分析了卫星可见光和红外波段测值与地表辐射收支的基本关系。在此基础上,

利用GMS静止气象卫星可见光和红外通道数值化资料和地表辐射收支观测资料, 建立了几个由卫星资料估计地面辐射收支的模式, 选择效果最佳的一种模式, 通过内插方法求取全国辐射收支分布。回归效果与实测结果比较表明, 此方法有实际应用价值。

关键词: 静止气象卫星 可见光辐射  
长波红外辐射 估计模式  
地面辐射收支

Chen Weimin and Gao Qingxian. 1997.

Estimating surface radiation budgets over China in summer from geostationary meteorological satellite (GMS) data. Scientia Atmospherica Sinica 21(2):238-246.

In this paper the basic relationship between the measurements from the visible/infrared channel in a satellite and the surface radiation budgets has been derived. Based on this relationship, some useful models of estimating the surface radiation budgets are obtained with observational data from the visible/infrared channel in geostationary meteorological satellite (GMS) and the observational data from surface radiation budget stations. With the best of these models, the distribution of radiation budgets across China is obtained by the interpolation method. When compared with actual observational data, this distribution has a better consistency with the actual results, which shows that this model is very effective in estimating the radiation budgets in China.

Keywords: geostationary meteorological satellites (GMS), visible radiation, longwave infrared radiation, estimate model, radiative budgets of surface

胡列群, 1997, 塔克拉玛干沙漠地面有效辐射研究, 干旱区地理, 20(1): 25-32

利用1988—1990年塔克拉玛干沙漠的整年沙漠辐射观测资料, 结合沙漠及周围地区有效辐射计算值, 分析了沙漠有效辐射的日变化及影响因子的作用, 同时分析研究了沙漠及周围地区有效辐射的年变化以及有效辐射的地理分布。

关键词: 塔克拉玛干沙漠  
地面有效辐射

**Hu Liequn.** 1997. Research on surface effective radiation in the Taklimakan Desert. *Arid Land Geography* 20(1):25-32.

Based on the surface effective radiation data collected from 1988 to 1990 in the Taklimakan Desert and the calculated data of surface effective radiation in the surrounding areas of the desert, the features of daily variation of surface effective radiation and some influencing factors on surface effective radiation in the desert are analyzed. The temporal and spatial distribution of surface effective radiation is also studied for the desert and its vicinities.

Keywords: Taklimakan Desert, surface effective radiation